COGNITIVE, DEMOGRAPHIC, AND MOTIVATIONAL FACTORS AS INDICATORS OF HELP-SEEKING IN SUPPLEMENTAL INSTRUCTION

A Dissertation

by

JOEL VICK MCGEE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2005

Major Subject: Educational Administration

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Approved as to style and content by:

Christine A. Stanley (Chair of Committee)	Bryan R. Cole (Member)
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ABSTRACT

Cognitive, Demographic, and Motivational Factors as Indicators of Help-seeking in Supplemental Instruction. (May 2005)

Joel Vick McGee, B.A., Baylor University;

M.A., Southwestern Baptist Theological Seminary

Chair of Advisory Committee: Dr. Christine A. Stanley

The purpose of this study was to determine how cognitive, demographic, and motivational factors can be used to understand help-seeking behavior in college students. Specifically, the study examined engagement in Supplemental Instruction (SI) of undergraduate students at Texas A&M University. An additional purpose of the study was to determine the efficacy of SI. The sample for the study was 2,407 undergraduate students who were enrolled in eight randomly selected courses at Texas A&M University in the spring 2004 semester. Students enrolled in multiple course sections were eliminated from the study. The revised sample consisted of 2,297 students.

Data collected for all students in the sample included student demographic information, SI attendance and participation, and final course grades. Students were also requested to complete an on-line survey instrument containing a modified version of the Motivated Strategies for Learning Questionnaire (MSLQ) and questions related to parent education and household income. Ultimately, 1,003 students from the revised sample submitted surveys

for a response rate of 43.7%. Based on attendance data and participation ratings, students were classified into three engagement groups for subsequent data analysis: high engagement, low engagement, and non-SI.

The following were among the major findings from the study:

- Hispanic students were significantly more engaged in SI than their White peers.
- Engagement in SI was inversely related to grade level classification.
- SI participants had significantly lower mean SAT math and verbal scores than students who did not attend SI.
- The motivational variables as a set had a statistically significant relationship with SI engagement.
- Extrinsic motivation, organization, academic self-efficacy, control beliefs, help-seeking, and peer learning were the motivational scales which best predicted SI engagement.
- Students who were highly engaged in SI had significantly higher mean final course grades than either non-participants or low engagement students even controlling for differences in SAT scores, cumulative grade point average, and motivation.

The study helps provide some insight into the dynamics of academic help-seeking. It also contributes to the growing body of evidence which shows that SI is an effective intervention for improving student success in traditionally difficult courses.

DEDICATION

This dissertation is dedicated to my wife, Amy, who has never wavered in supporting me in the pursuit of my goals and dreams and who inspires me daily as she pursues her own passions and to my sons, Landon Brooks McGee and Grayson Gentry McGee. I pray that they will have the courage and perseverance to pursue their dreams and that they will have a passion for learning that will last a lifetime.

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To the staff at CAE, past and present, thanks for your encouragement and support throughout my studies. I want to especially thank Clevia Johnson, Linda Callen, Donna Lamarche, Debbie Perez, Jennifer Petrick, and Sharron Roberts for making CAE feel like home to me.

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To the dozens upon dozens of other SI leaders I have had the great privilege of working with over these past ten years, I thank you for helping me

understand the essence of SI. It is chiefly because of our SI leaders that our program was awarded the Outstanding SI Program award at the International Supplemental Instruction conference in Boston last June.

To the faculty for the eight targeted SI courses, Dr. Rizzo, Dr. Johnson, Dr. Reed, Dr. Peck, Ms. Flaherty, Dr. Doerfler, Dr. Tiner, and Dr. Wolf, thank you also for your willingness to help me, offer advice, and encourage your students to participate not only in this study, but in SI.

There are countless other colleagues, friends, and fellow graduate students at Texas A&M to whom I am grateful for making a Baylor Bear feel at home in Aggieland. You all have helped me come to love and appreciate this university more and more as the years have gone by.

I am most fortunate to have been born into a family that valued higher education and learning. I would not be the person I am today without the legacy of my great grandparents who earned college degrees in the 19th century, my grandparents who inspired me to value education by both word and example, and my parents who provided the support and resources necessary to pursue my own educational goals.

I am especially thankful for two members of my family who, though no longer with me in body, will always be with me in spirit. My grandfather, Dr. J. Earl Mead, never attended college, but was the first person in our family to receive a doctorate when he was awarded an honorary degree from Baylor University. He taught me to love the natural world, to laugh without abandon,

and to be content with the gifts of God. My mother, Lois Harper McGee, taught me to love books and to never stop learning.

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Finally, I thank my Lord and savior Jesus Christ for keeping me in His hand and for giving purpose to my life. I pray that my efforts will ultimately bring glory to Him.

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CHAPTER I

INTRODUCTION

Over the past several decades, colleges and universities have increasingly sought to make higher education accessible to all students regardless of race, ethnicity, or socioeconomic status. One result of this trend has been college enrollments which are less homogenous and more likely to include students who do not possess the requisite academic preparation to succeed in college (Hodges & White, 2001). Most colleges and universities provide some form of academic support programming to help these less prepared students succeed academically. This support usually takes the form of programs such as tutoring, academic advising or counseling, study skills instruction, Supplemental Instruction (SI), or developmental courses. These and other similar interventions have been shown to be effective in improving student grades and increasing retention rates (Hodges & White, 2001; McKeachie, Pintrich, & Lin, 1985).

A problem inherent in providing academic assistance programming is that in most cases these interventions require initiative on the part of the students. Tutoring and SI, for example, are typically voluntary and require students to sign up or attend based on their own perceived need for help (Hodges & White, 2001). Most academic advising and counseling must also be student initiated (Alexitch, 2002). For this reason, it is important for providers of academic

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assistance programming to understand the dynamics of help-seeking behavior.

Help-seeking has been identified as one of the processes of self-regulated learning (Newman, 1998; Zimmerman, 1998). Schunk (2000), pointed out that help-seeking is a complex process that involves both cognitive and motivational dimensions. Help-seeking processes have not only been identified in academic settings, but have also been demonstrated to be used in other domains such as writing, athletics, and music (Zimmerman, 1998). Zimmerman noted that help-seeking can be understood as an adaptive strategy employed by experts in various domains. Karabenick and Knapp (1991) looked at help-seeking in higher education settings and found that help-seeking could be properly viewed as an achievement-related learning strategy rather than as a manifestation of dependency. Magnusson and Perry (1992) found that help-seeking in college students was influenced by both classroom factors and teacher characteristics.

The fact that help-seeking is such a complex learning strategy may be one explanation for the difficulty of providing academic assistance to those most in need of it. Ryan, Gheen, and Midgley (1998), noted that help-seeking behavior was positively correlated to high self-efficacy and called this “troubling” because the “students who do not feel capable of doing their work are the ones most likely to avoid asking for help” (p. 528). Hodges and White (2001) suggested that high-risk students may not be as capable of judging their own need for assistance as more prepared students. Nolen (1996) noted that help-

seeking behavior can sometimes be interpreted as an indicator of low ability and carries a social stigma especially when social interactions are involved. By contrast, Newman (1991) maintained that help-seeking is a highly developed characteristic of self-regulated learning which is most often exhibited by learners who have high self efficacy and good socialization skills. Help-seeking has also been found to be related to achievement goals. Ames and Archer (1988) found that middle school students with a mastery orientation to learning were more likely to seek help than students with a task orientation.

Other cognitive learning theories have been applied to the issue of help-seeking behavior. Carol Dweck (1999) has developed a theoretical model based on implicit self-theories. She maintained that people hold implicit theories about intelligence, personality, or morality as being either fixed entities or qualities which are subject to change. Those who view these qualities as fixed are referred to by Dweck and others as entity theorists. Those who see qualities such as intelligence as malleable are called incremental theorists. Based on this model, students who hold an entity theory of intelligence have been found to be less likely to seek help when confronted with difficult learning tasks (Dweck, 1999). Both self-regulated learning theory and Dweck's self-theories model assume that help-seeking is not a function of a fixed quality, but rather something which can be changed with proper educational interventions. Dweck and others (Ryan, Gheen, & Midgley, 1998) have demonstrated that

interventions can be effective in improving students' ability to use help-seeking strategies.

Other lines of inquiry support the contention that help-seeking can be predicted by looking at student characteristics which have been used to identify "at-risk" students. For example, Stansbury (2001) studied help-seeking behavior among students identified as at-risk because they were low-income, first-generation college students. Hodges and White (2001) asserted that high-risk students were much less likely to attend SI or tutoring. In their study, students who were conditionally admitted to college were identified as high-risk and targeted for an intervention designed to encourage help-seeking behavior. Gloria, Hird, and Navarro (2001) found that students' ethnicity and gender impacted their willingness to seek help. The assumption of these and other theorists is that students who have been identified as high-risk are less likely to seek out help. Student characteristics which are typically used to identify high-risk for failure are cognitive factors such as low high school grades or low SAT or ACT scores, and demographic factors such as first-generation college status, low socio-economic status, or in some cases membership in underrepresented populations such as ethnic minorities.

STATEMENT OF THE PROBLEM

Although most of the research on academic help-seeking has been based on studies of primary or secondary students, there has been some research which looked at help-seeking in post-secondary settings (Hodges & White, 2001;

Karabenick & Knapp, 1991; Knapp & Karabenick, 1988; Magnusson & Perry, 1992; Shwalb & Sukemume, 1998). Most of this research has studied help-seeking within classroom settings. Since college students are expected to do much of their learning outside the classroom, it is important to look at help-seeking which occurs in other settings. There seems to be a dichotomy between those who emphasize cognitive or demographic factors as predictors of help-seeking behavior in college students (Hodges & White, 2001; Stansbury, 2001) and those who point to motivational dynamics (Karabenick & Knapp, 1991; Magnusson & Perry, 1992). Academic assistance administrators are often at a loss to understand why certain students are willing to seek out help and others will literally fail rather than ask for readily available help. In order for universities and colleges to provide effective retention and academic assistance programs, a better understanding of help-seeking behavior among college students is needed.

Supplemental Instruction (SI) provides an excellent setting to better understand help-seeking behavior. SI was created by Deanna Martin of the University of Missouri at Kansas City in 1973 (Martin & Blanc, 1981; Widmar, 1994). SI is out of class, peer-facilitated group study which is made available to every student enrolled in a targeted course. SI is both voluntary and free. SI targets difficult courses rather than targeting high-risk students, so there is an equal chance for students of all ability levels, background, and motivation to seek out or not seek out the assistance provided in SI. For this reason, active

engagement in SI can be one way to operationalize help-seeking behavior in college students.

PURPOSE AND RESEARCH QUESTIONS

The purpose of this study was to determine how cognitive, demographic, and motivational factors could be used to understand help-seeking behavior in college students. Specifically, the study examined engagement in Supplemental Instruction of undergraduate students at Texas A&M University. An additional purpose of the study was to determine the efficacy of SI. The following research questions were addressed in this study:

1. What is the relationship of the demographic variables with engagement in SI?
2. What is the relationship of the cognitive variables with engagement in SI?
3. What is the relationship of the motivational variables with engagement in SI?
4. What is the relationship of level of SI engagement with success in the targeted courses?

OPERATIONAL DEFINITIONS

The following definitions will be pertinent to this study:

Academic Assistance Programming: Services such as Supplemental Instruction or tutoring provided by a university to help students succeed in college courses.

Center for Academic Enhancement: A learning success center of Texas A&M University which provides academic assistance and retention programming including Supplemental Instruction.

Cognitive Variables: A set of predictor variables based on cognitive achievement including SAT scores, high school rank, and college grade point average.

Demographic Variables: A set of predictor variables including risk factors such as socioeconomic status, ethnicity, gender, and parent education.

Engagement: A measure of participation in SI sessions which is a combination of attendance and degree of active participation as rated by SI leaders.

Help-seeking: A self-regulated learning strategy which involves seeking appropriate academic assistance when it is needed.

Motivation Variables: A set of predictor variables based on scores on the adapted Motivated Strategies for Learning Questionnaire (MSLQ) and questions related to understanding of intelligence.

Motivated Strategies for Learning Questionnaire (MSLQ): A self-report assessment instrument designed to measure students' motivational orientations and use of learning strategies (Pintrich, Smith, Garcia, & McKeachie, 1991).

Retention: Student persistence defined as continued enrollment in the university after one or more semesters.

Supplemental Instruction (SI): An academic assistance program which targets traditionally difficult courses by providing peer-facilitated study sessions for students enrolled in the targeted course sections.

Supplemental Instruction Motivation Questionnaire: An on-line survey instrument developed for this study which contained demographic questions, questions related to theory of intelligence, and questions adapted from the MSLQ.

SI Leaders: Undergraduate student leaders who have demonstrated proficiency in a course content area who are hired to attend class and hold out-of-class study sessions integrating study skills and specific course content.

Targeted Courses: Courses or course sections which have an SI leader assigned to them. Targeted courses are typically courses with high enrollment, high attrition rates, and courses which are traditionally difficult.

LIMITATIONS

1. The MSLQ was not specifically designed as a predictive instrument and has been adapted for that purpose for this study.
2. Several of the variables are based on self-report data which may not be reliable.

SIGNIFICANCE

One of the important implications of this study is to shed some light on theoretical perspectives related to help-seeking. There is some evidence in the literature that help-seeking behavior is affected by students' motivation and goal orientation (D.L. Butler, 1998; Dweck, 1999; Ryan, Gheen, & Midley, 1998). The results of this study could help support this theory.

Understanding the dynamics of help-seeking has some important implications for educational practice. First, if it is known that students with certain motivational and goal orientations are more likely to seek out help, interventions which are known to increase these orientations could be implemented. Carol Dweck (1999) has demonstrated some success in helping students change attributions and understanding of intelligence. Similar success was noted by Andrews and Debus (1978) in retraining students' attributions. Hofer, Yu, and Pintrich (1998) report on their success in teaching self-regulation strategies to college students.

Another implication for educational practice would be to use this predictive model to identify students who are less likely to seek help and provide interventions designed to encourage their participation. Extra marketing of academic support services could help encourage students to seek out help who might otherwise be reluctant. Academic advisors or study skills instructors, if made aware of students who are less likely to seek help, could intervene and encourage participation by reluctant students.

Supplemental Instruction is a widely used academic assistance intervention which is international in scope and has been implemented at both small and large campuses (Arendale, 1994). The results of this study will contribute to the growing body of evidence on the effectiveness of SI and may be useful for SI administrators in refining the program for specific populations of students.

Understanding help-seeking behavior is an important aspect of providing effective academic assistance programs. It is expected that this study would provide insight into this phenomenon and would produce a predictive model which would have utility in educational practice.

CHAPTER II

REVIEW OF LITERATURE

One of the realities of higher education in the 21st century is that many students come to campus unprepared or underprepared for the academic rigors of college. Other students may enter college ostensibly prepared, but find that they, too, are unable to thrive academically. Failure to thrive academically typically results in attrition, low grades, or failure to meet other academic goals such as entering the student's major of choice. While some state governments have sought to close the college preparation gap by implementation of so-called K-16 programs and other initiatives (Texas Higher Education Coordinating Board [THECB], 2000), the lack of preparation by incoming students is taken as a given by many college faculty and administrators (Schneider, 2003). College and university administrators have sought to address the problem of students' lack of preparation by offering a myriad of academic support programs to help students succeed in college. Almost all community colleges and by some estimates 80% or more of public four-year schools provide developmental courses (Hoyt & Sorensen, 2001; Boylan, 1999b) in reading, writing, or mathematics. Virtually all institutions provide some form of academic assistance in the form of other services such as tutoring, academic advising centers, study skills courses, Supplemental Instruction (SI), or independent study laboratories. Cutright (2002) noted that even the large research universities are seeking to provide supportive learning environments in the form of learning communities, peer-

learning initiatives, and a variety of other programs targeted at undergraduates in general and first-year students in particular.

One of the common characteristics of academic support services is that students must initiate contact. In other words, students are required to seek out help. The purpose of this study is to better understand the characteristics of students who are willing to seek help. By providing a better understanding of students who willingly participate and engage in Supplemental Instruction (SI), this study should give some insight into the issue of academic help-seeking particularly in the context of college-level academic support programs. The study will also look at the efficacy of high engagement in SI as determined by course persistence and final course grade.

This chapter will look at the current understanding of academic help-seeking in the research literature. The first section will discuss college success outcomes and studies which have looked at defining and predicting college success. As a foundation to discussing academic help-seeking, the chapter will outline some information in the research literature about help-seeking in general. This will be followed by a discussion of academic help-seeking as a component of self-regulated learning. Characteristics of students who are more or less likely to seek out academic assistance will be the topic of the next section. This discussion will be divided into two subsections which will outline literature concerning demographic and motivational factors which may impact help-

seeking behavior. The final section will look at the literature on the development of the SI model and research into its effectiveness.

DEFINITIONS OF COLLEGE SUCCESS

The topic of academic help-seeking presupposes that college-level studies are difficult for many, if not most, students. Students need to seek help because they are unable to achieve some level of success working on their own. The purpose of this section is to define college success and look at research which has sought to identify factors predicting success.

In the broadest sense, success in college can be defined as achieving the goals which led to the student's original enrollment. For the purposes of this study, this definition is overly broad because it encompasses both social and academic success and in many ways is difficult to measure. For example, is a student who leaves school after her freshman year to pursue a career in the arts successful? Is a student who completes four years of study with a low grade point average, but is able to start a new business successful? While these examples can lead to interesting philosophical discussions, they may not represent typical cases and they do not directly relate to the topic at hand. For most students, leaving school after only one year or struggling along with low grades for several semesters are indications of failure rather than success. In fact, the most common outcome measure of college success in research literature has been performance in the form of grades and persistence (Robbins et al., 2004). Understanding student characteristics which may contribute to

these success outcomes can help one understand what kinds of students may be less likely to be successful. Students considered less likely to succeed have typically been labeled as “at risk” and are one of the focal points of this study.

Robbins et al. (2004) produced a comprehensive meta-analysis of research into performance and persistence. They looked at cognitive and demographic factors as well as psychological and study skills factors from 109 previous studies to determine which ones best predicted performance and persistence outcomes. In general terms, the authors found that the psychological and study skills factors were better predictors of success outcomes than cognitive or demographic factors. The best predictors of grade point average were self-efficacy and achievement motivation.

In their meta-analysis, Robbins et al. (2004) looked at persistence and performance separately. In predicting retention, the authors identified three psychological and study skills constructs which consistently across studies showed the highest correlation with retention. These were academic-related skills (or study skills), academic self-efficacy, and academic goals. Interestingly, the authors found that general self-concept and achievement motivation had rather low positive correlations with retention. Among the cognitive and demographic variables, socioeconomic status, high school grade point average, and scores on college entrance examinations all had moderately high correlations with retention outcomes.

When Robbins et al. (2004) looked at performance, the results were slightly different. For performance, the criterion variable for most studies has been first year grade point average. The best predictor of college performance has been high school grade point average. However, academic self-efficacy was almost as strong a predictor of success as high school grades and was a better predictor of performance than scores on college entrance examinations. Unlike the results in the retention studies, achievement motivation has been found to be a very good predictor of academic performance. General self-concept was again found to be a rather poor predictor of success. This could be an important finding in designing academic interventions. Programs which are designed to boost general self-esteem may not have as positive an impact on college success as programs which focus specifically on academic issues.

Understanding factors which may predict college success is, for the purpose of this study, only the first part of the picture. The overarching question is whether students who may be less prepared for college and therefore less likely to succeed will be willing to seek out the necessary assistance to achieve success. The next section will begin the examination of academic help-seeking as a construct in order to set the stage for this study.

FOUNDATIONAL UNDERSTANDING OF HELP-SEEKING

There is a fairly extensive body of literature on the subject of help-seeking in general. Bella M. DePaulo (1983) suggested that a “prototypical” (p. 3) case of help-seeking would involve a perceived problem or need which might benefit

from the resources of others in which the person needing assistance directly asks for aid. A simple model of help-seeking described by Gross and McMullen (1983) involves a three-step process which includes the perception of a problem, a decision to seek outside help, and use of strategies and tactics to obtain the help. Gross and McMullen noted that this model greatly oversimplifies the reality of the "tortuous route of many help-seeking decisions" (p. 48).

Most research into help-seeking has centered on the various factors which either inhibit or facilitate help-seeking behavior. Researchers have identified a variety of factors both psychological and social which might inhibit help-seeking. Rosen (1983) noted that a student's perception of inadequacy can inhibit help-seeking even though the student understands that help is needed. A related factor which has been found to inhibit help-seeking is embarrassment although, as noted by Shapiro (1983), seeking help does not always lead to embarrassment. The mitigating factor is how the help-seeker interprets his or her need for help. Other lines of inquiry have looked into self-esteem (Nadler & Mayseless, 1983), human development (Eisenberg, 1983), and equity theory (Fisher, Nadler, & Whicher-Alagna, 1983) to better understand the dynamics of help-seeking.

It has already been noted that help-seeking is a complex process. Nadler (1991) noted that any act of seeking help will involve both benefits and costs. The benefits may be ease of suffering or the ability to complete a difficult task. The costs are usually psychological in the form of threats to confidence or loss

of independence. This perspective may help explain why help-seeking models have difficulty in explaining individual differences, because one person may be more focused on the benefits while others may be more concerned about the costs. The complex interplay of costs and benefits can be seen in even relatively simplistic help-seeking situations such as asking for directions.

The understanding of help-seeking processes has been applied to several different fields including victim aid, medical helping, counseling, international aid, and education (Nadler, 1983). For this study, the domain of interest is academic help-seeking. The next section will focus on help-seeking in the academic domain.

ACADEMIC HELP-SEEKING

In the academic domain, help-seeking is called for when students experience academic difficulty. Students have a choice to either seek out help or try to continue to work independently. It is often the case that students experiencing difficulty will not seek help and will instead either continue to work without success or give up (Newman, 1998). From this perspective, then, seeking help is understood to be an adaptive learning strategy which can be utilized by students who encounter difficulty. Help-seeking is thought to be an important component of self-regulated learning (Schunk, 2000; Zimmerman, 2001).

Self-regulated learning is defined by Zimmerman (2001) as “neither a mental ability nor an academic performance skill” (p. 1), but rather a process in

which the learner takes proactive steps to use mental processes to accomplish academic tasks. The key component of self-regulation is that it is learner-driven rather than instructor-driven. Self-regulation can be thought of as a continuum from passive to active learning. A student on the high end of the continuum would be considered highly involved in his or her own learning and keenly aware of both general and specific learning goals. On the low end of the continuum would be passive learners who react to instructor direction and may only be vaguely aware of learning goals. For example, Kitsantas (2002) found that the use of self-regulated learning strategies was an integral component in the success of college students enrolled in an introductory Psychology course. In addition to active involvement in learning, self-regulation implies a self-directed learning cycle whereby students adjust learning strategies and goals based on their own evaluation of progress toward meeting learning goals. Self-regulation requires a high degree of metacognitive awareness on the part of the student in order to effectively evaluate learning, make adjustments, and adapt strategies (Newman, 1998; Zimmerman, 2001).

There are a number of specific learning strategies and behaviors which are most often associated with self-regulated learning. Schunk (2000) identified five categories of strategies which students can use in directing their own learning:

1. Rehearsal: Repeating information, summarizing, underlining or highlighting

2. Elaboration: Use of mnemonics, imagery, note-taking, pegging, keywords, questioning
3. Organization: Outlining, mapping, mnemonics, grouping of information
4. Comprehension monitoring: Self-questioning, rereading, paraphrasing, self-testing
5. Affective techniques: Coping with anxiety, self-verbalization, positive thinking, time management

In addition to these strategies, Schunk noted several motivational components to self-regulated learning. Among these were self-efficacy, understanding of attributions, goal orientation, and help-seeking. Help-seeking is considered to be just one among a constellation of strategies and motivational components of self-regulation. In discussing self-regulation, Pintrich and Garcia (1994) noted that these learning and thinking strategies are distinct from learning styles or personality styles. Strategies are thought to be behaviors that can be learned and perhaps more importantly, as components of learning that are ultimately under the control of the learner. Learning styles and personality traits, on the other hand, are not typically thought of as learnable and under the direct control of the student.

The specific role of help-seeking for the self-regulated learner is to cope with situations when he or she experiences difficulty. From this perspective, help-seeking is a strategy employed by learners to overcome difficulty and to progress toward learning goals. Help-seeking is a behavior which can be

learned and employed to help students improve their own learning. Such a perspective is bolstered by empirical studies which have linked active learning with help-seeking. For example, Karabenick and Knapp (1991) found in a series of studies with college students that those who were identified as active learners were more likely to seek out help when they perceived themselves to be in need of help. In other words, the self-regulated students were more likely to seek out help as a learning strategy. Zimmerman (1998) noted that help-seeking is a common strategy employed as a part of self-regulation in not only academics, but also, in domains such as music, writing, and athletics.

There is an important distinction to note here regarding the help that students will seek out in a learning situation. In her seminal article, Sharon Nelson-Le Gall (1981) identified two basic types of academic help-seeking that can occur which were labeled as “executive” and “instrumental” (p. 227). The primary difference in the two types relates to the goals of the help-seeker. The goal of executive help-seeking is to get someone else to provide a solution on behalf of the learner. Executive help-seekers may or may not actually need help. This type of help-seeking is highly dependent and would not be thought of as being a component of self-regulated learning. Students who frequently engage in executive help-seeking may become overly dependent on instructors and fail to thrive academically. Instrumental help-seeking, on the other hand, occurs when the learner only asks for enough help to allow for completion of the learning task on his or her own. In other words, instrumental help-seeking would

be employed as a strategy for a learner who is “stuck” and needs assistance to progress toward learning goals. Nelson Le-Gall asserted that engagement in instrumental help-seeking may help children develop both academically and socially.

Building on the work of Nelson Le-Gall, Richard S. Newman (1998) described what he termed “adaptive” help-seeking behavior. He proposed that adaptive help-seeking could be understood as a four-part process in classroom settings. The four-part process in brief is as follows:

1. The learner is aware of the difficulty of the task.
2. The learner considers the necessity of and availability of help using the most pertinent information in the context of the specific learning situation or problem.
3. The learner asks for help in a way that is appropriate for the learning situation.
4. The learner makes use of assistance in a way that is most likely to ensure that future help-seeking can be used as a strategy to deal with future difficulties.

The first part of the process involves metacognitive awareness. In other words, an adaptive help-seeker must first encounter difficulty and recognize it as such. This aspect of adaptive help-seeking fits the self-regulation paradigm in that metacognition is a central component of self-regulated learning (Zimmerman, 2001). A student who underestimates the difficulty of an academic

task may not be aware of her need for help. A student who overestimates the difficulty may ask for help when it would be possible to persist to an independent solution.

In the second part of the adaptive help-seeking process, the learner will make a sophisticated assessment of the both the necessity and the availability of help. In making this assessment, the learner would consider whether or not continuing to work independently is likely to produce progress toward resolution of the learning task. The learner may consider what resources are available that do not involve asking for help. The student may consider whether he can change his approach to the learning task or attack the problem from another direction. If and when it is determined that independent work is unlikely to produce further progress, then the adaptive help-seeker would determine who to approach for help and what questions to ask in seeking help. Again, this part of the process is highly consistent with what is understood to be self-regulated learning. It is a very active process and one that is directed by the learner rather than the instructor.

Once the adaptive help-seeker has decided to seek outside help, in the ideal situation, she will attempt to formulate a request that is designed to get past the immediate difficulty without jeopardizing the chance for future success. This is another way in which adaptive help-seeking builds on Nelson-Le Gall's concept of instrumental help-seeking. In this third part of the process, the key is that the help that is sought appropriately meets the demands of the situation. In

other words, the help-seeker may ask for a hint or a clarification rather than trying to short-circuit the learning process by asking for the complete solution to the problem. Overstepping the process at this point could digress into executive help-seeking.

Once help is obtained, the adaptive help-seeker appropriately uses the assistance to progress toward the learning goal and then reevaluates the difficulty of the task to determine whether additional assistance is needed. Adaptive help-seeking is in some ways a microcosm of self-regulated learning. This final step parallels the recursive nature of self-regulated learning wherein the learner continually reevaluates the learning task and seeks to progress toward specific learning goals. It is not surprising then that students who utilize strategies associated with self-regulation also are more likely to seek appropriate help (Karabenick and Knapp, 1991).

It must be noted that Newman's model of the adaptive help-seeking process is that of the ideal situation. In addition, Newman (1998) noted that this process should not be understood as taking place in an orderly and sequential way. There may be a great deal of parallel processing and interactivity in a specific help-seeking situation that does not neatly fit into the model as described. As previously noted, help-seeking is a complex process and involves psychological and cognitive aspects which most assuredly defy simple description.

Another very similar development of Nelson-Le Gall's concept of instrumental help-seeking is termed "strategic" help-seeking (Karabenick, 1998). In this conceptualization, help-seeking is understood to be an important learning strategy that can be mastered by effective learners and should be actively supported by effective teachers. Karabenick frames this idea of strategic help-seeking as a component of social-interactive learning in addition to recognizing its role as a specific component of self-regulated learning. The social-interactive nature of help-seeking can be important in understanding some of the complexities of help-seeking behavior. This will be explored further in the section on factors which influence help-seeking behavior. In looking at help-seeking as a component of self-regulated learning, Karabenick uses the executive versus instrumental model to distinguish help-seeking situations which do or do not qualify as self-regulation. In a study of college students, Karabenick (2003) found that students who felt that seeking help would be an admission of failure, which he calls help-seeking threat, were more likely to use executive help-seeking. Conversely, students who were less threatened by seeking help were more likely to use instrumental strategies.

Karabenick (2003) also makes a distinction between formal and informal help-seeking. This concept relates to the target or source of the help that learners seek. Formal help would include institutional sources such as faculty, teaching assistants, or help sessions. Informal sources are typically other students such as classmates or roommates. Karabenick (2003), whose work

has been primarily with college students, found that students who were instrumental help-seekers were more likely to go to formal sources of help. Interestingly, Supplemental Instruction, which is the focus of this dissertation study would likely be characterized as informal using Karabenick's operational definition which is solely based on whether the source of help is a teacher or another student. It could certainly be argued that SI is a formal source of help given that it is institutionally funded and administered.

At its essence, academic help-seeking in general and specifically instrumental help-seeking is understood to be a component strategy that can be framed within a larger set of behaviors and strategies labeled as self-regulated learning. This does not, however, get at the underlying complexity of who is most likely to use this strategy as part of their learning. There is a growing body of literature into help-seeking that seeks to shed some light on individual differences in help-seeking behavior. The next section in this review of the research will focus on this literature to set the stage for the present study. It is divided into two sections which detail research into demographic and motivational characteristics.

CHARACTERISTICS OF HELP-SEEKERS

The previous two sections looked at research which was focused on understanding the process of general and academic help-seeking. There was an attempt to put help-seeking into perspective within self-regulated learning theory and to introduce the concept of instrumental versus executive help-

seeking and the subsequent developments of that concept. With this foundational understanding of help-seeking, the next logical step is to explore the research on who is most likely to seek help.

Demographic Explanations

One focus of research into help-seeking behavior has been to look at demographic or risk factors. Researchers have sought to understand how gender, ethnicity, or socio-economic status (SES), may or may not be related to students' likelihood to seek help in academic situations. This line of research flows out of other research which has looked at how these and other demographic factors relate to academic success outcomes. One of the concerns in higher education in particular has been whether students who are most at risk for failure are also less likely to seek out help when they experience difficulty (Arendale, 1994). There has been some limited research which has supported the assertion that high risk students are less likely to seek help. Friedlander (1980) found that students identified as high risk based on economic and social disadvantage were less likely to use academic support services. Stansbury (2001) found that at-risk students were less likely to attend SI than students who were not identified as at risk. Hodges and White (2001) found that an intervention designed to encourage at-risk students to attend SI and course tutoring was not effective in changing more ingrained patterns of behavior.

While these studies do seem to suggest that higher risk students may be less likely to seek out appropriate help, there are two problems that should be

noted. First, there is not a general consensus about what cluster of characteristics and attributes should be used to identify high risk students. Low socio-economic status, membership in a minority group, and low parent education are fairly typical, but even these categories leave quite a bit of room for interpretation. For example, SES may be a relative measurement depending on the particular higher education institution the student is attending. There is also some disagreement about how to treat gender. While female students are still considered to be more at risk in some specialized fields such as engineering, in general, women are increasingly more successful in higher education than men. This subsection will look at what the literature can tell us about the relationships between gender, ethnicity, SES and help-seeking.

Gender

The research literature is a bit mixed on the role gender plays in help-seeking behavior. On the one hand, the oft-cited stereotype that men will not ask for directions does seem to have some support in help-seeking literature. Nadler (1991) noted that females are more likely to seek help than males in a number of different contexts and that this has been one of the most consistent findings in all of the help-seeking literature. Addis and Mahalik (2003) reviewed research on help-seeking in a variety of domains including medical, mental health, and substance abuse counseling and found that in almost every study men were less likely to seek out help. Alexitch (1997) looked at preferences for academic advising and found that female students were more likely than their

male peers to prefer developmental advising. Similarly, Gloria, Hird, and Navarro (2001) found that female college students were much more likely to seek help in the form of personal counseling than male students.

One explanation given for the finding that females are more likely to seek help than males is that help-seeking may better fit the typical feminine gender role in society (Nadler, 1991). This explanation is echoed in the work of Ryan, Gheen, and Midgley (1998) who suggested that adolescent girls may be more likely to ask for help because it fits with the perceived stereotype of girls as unassuming and less independent. This supposition was based on their study of avoidance of help-seeking in adolescent students. They found that male students were much more likely to avoid asking for help when it was needed than their female peers. One notable exception to the consistent finding of females being more likely to seek help was a study by Martin (2002). In the study, he found that males were significantly more likely than females to seek out psychological help. His dissertation study was based on a survey of 95 non-retired adults from ages 21 to 62.

Other researchers have not found a gender effect in help-seeking. In a series of experimental studies with elementary students in Israel, Ruth Butler (1998) found that girls were no more likely than boys to seek help from their teachers. The more important determinant of willingness to seek help according to her research was the perception of threat to feelings of competence. She concluded that males may be just as willing to seek help as females as long as

seeking help is not viewed as threatening. In another study with college students, Ruth Butler (1993) found that there were no significant gender differences in help-seeking in an experimental study which tested students' willingness to seek help in completing a problem solving task. It is somewhat rare to find a study in which males sought help more than females, but this was the case in a study by Arbreton (1998). In this study, she differentiated between instrumental and executive help-seeking and found that boys were slightly more likely than girls to seek executive help, but that boys were also more likely to avoid help when it was needed. Arbreton concluded, however, that this difference was a function of differences in goal orientation rather than differences in willingness to seek help. In her analysis, when differences in goal orientation were statistically held constant, there were no differences in the frequency of help-seeking between boys and girls.

Other Demographic Factors

Unlike gender, the relationship between other demographic factors and help-seeking has been much less frequently researched. Gloria, Hird, and Navarro (2001) conducted a survey study with college students that looked at race and gender. The results of this study indicated that minority students were less likely than their white peers to seek help in the form of personal counseling. They did note that the differences in help-seeking behavior could perhaps be more a function of culture than ethnicity per se. They found that for both white and minority students, cultural context played an important role in their

willingness to seek help. In other words, students whose culture was more congruent with the prevalent culture of the university were more likely to seek institutional help. In his dissertation, Martin (2002) compared help-seeking behavior of White and African American adults and found that the White adults were significantly more likely to seek out help in the form of psychological counseling. In the context of primary and secondary education, Nelson-Le Gall and Resnick (1998) suggested that the common socialization patterns of African American families may actually be more conducive to development of strategic help-seeking than what is found in White families, but that school systems have not tended to focus on development of strategic help-seeking. This theory is in some measure supported by Sheu and Sedlacek (2002) who found that African American college students had much more positive attitudes than White and Asian students about seeking help in the form of academic assistance programs such as study skills and time management training. By contrast, Bembenutty and Karabenick (1997) studied African American and White students and found no significant differences on a measure of help-seeking behavior. This finding was replicated in a later study by Bembenutty (2002) with a sample of 369 college students including 79 minority students. Fisher, Winer, and Abramowitz (1983) noted the difficulty of parsing out the relative effects of race and socio-economic status and suggested that race may not be a very strong predictor of help-seeking behavior when controlling for the effects of social class.

As Nadler (1991) noted, there is generally a positive relationship between socioeconomic status (SES) and willingness to seek help. Since many of the studies which look at help-seeking are based on participants' willingness to seek out professional services, it may be that this difference is a reflection of the cost of obtaining help rather than some inherent characteristic of social class. Martin (2002) also found that lower income individuals were less likely to seek out help in the form of psychological counseling. Fisher, Winer, and Abramowitz (1983) suggested that while income and willingness to seek help are generally positively related, that there is enough conflicting evidence to cast some doubt on the importance of this finding. One of the most interesting studies regarding social class and help-seeking was conducted by Asser (1978). The research involved a content analysis of a help-seeking survey and the researcher found that low and high income individuals tended to employ different styles of help-seeking. Higher income individuals were found to seek help more often, but were also more likely to use what was termed a negotiating style of help-seeking which is very similar in nature to instrumental help-seeking. Lower income individuals sought help less often and were more likely to use an executive style of help-seeking.

The only other demographic factor which seems to have received some attention in the research literature is age. Since this research has been largely based on utilization of psychological services, it only encompasses adult behavior. Nadler (1991) noted that in most of the research younger adults have

been more likely than older adults to seek out help and that there is a particularly sharp drop for those over the age of 60. This line of research has not been conducted in academic settings and would not seem to be relevant with traditional aged students. However, it could be relevant on campuses which serve a large number of non-traditional students.

Based on the research literature, it appears that predicting help-seeking behavior based on demographic variables is a difficult proposition. In addition, while this dissertation study is concerned with academic help-seeking, a large percentage of the studies related to demographic factors in help-seeking looked exclusively at help-seeking in the context of counseling or other psychological services. The dynamics involved in the academic domain may have some very real differences from other forms of help-seeking. While a number of studies have found that females were more likely than males to seek out help in most contexts, there are enough studies which contradict this finding to consider this a mixed result. The same trend is found in studies which have looked at race. In most of the studies, the researchers found that African Americans were less likely than Whites to seek out help. However, there were some notable exceptions to this trend. This also should be considered a mixed result. In the case of socioeconomic status, the empirical evidence does seem to suggest that willingness to seek help is positively related to income, however, other variables such as race and parent education are correlated with income and may be confounding variables.

Motivational Explanations

As was noted in the previous section, predicting or explaining help-seeking behavior based on demographic characteristics is difficult and unlikely to provide effective models. Another line of inquiry into help-seeking has been to look at various motivational factors to explain why certain individuals will seek out help. One of the advantages of this line of inquiry is that it has been more often applied to the domain of interest to this study which is academic help-seeking. There are several major areas of motivational theory which have been applied to help-seeking: goal theories, attribution theory, self-efficacy, and intrinsic/extrinsic motivation. This section will treat each of these in turn and look at what the research literature can tell us about these general constructs and their relationship to academic help-seeking.

Goal Theories

Goal theory is an area of motivational theory which is focused on the relationships among goals, understanding of ability, and expectations of outcomes (Schunk, 2000). A central conception of goal theory has been to differentiate the types of goals that are involved in achievement situations. Typically goal theorists have talked about a dichotomy of goal types such as learning versus performance goals or mastery/task goals versus ego goals. Goal theory postulates that the goal focus of someone in an achievement situation will affect their motivation and cognitive processes. For example, it has been found that students who have a learning or mastery goal focus will be more

likely to persist at learning tasks, more self-efficacious, more willing to attempt challenging tasks, and more likely to use effective strategies than students who are performance or ego oriented (Ames & Archer, 1988; Schunk, 2000). Nolen (1988) found that students with a mastery orientation to learning were more likely to use deep processing strategies for learning than students who were ego focused. Within this framework, adaptive or strategic help-seeking, then, is understood to be an effective strategy that is consistent with a mastery or learning goal orientation.

In his 1997 study, Alexitch looked at how goal orientation related to college students' preferences for and attitudes about academic advising. In this study of 81 undergraduate students, he found students with a learning goal orientation were more likely to prefer a higher level of developmental advising, sought out advising help more often, and were more satisfied with advising than students with a performance goal orientation. Alexitch noted that this may be problematic in that performance oriented students may be the students most likely to experience difficulty and thus be most in need of effective advising help.

Goal orientation may also relate to whether students utilize different types of help. Karabenick (2003) found that students with a mastery goal orientation were more likely to utilize instrumental help-seeking strategies. Students with a performance goal orientation were more likely to use an executive style of help-seeking. He also found that students with a performance goal orientation were much more likely to perceive help-seeking as threatening than those with a

mastery orientation. Butler and Neuman (1995) reported a similar relationship between mastery goal orientation and instrumental help-seeking in a study with middle school students.

Self-theories

A related concept to the goal theories is what are called self theories. Some researchers sought to understand why certain students seemed to be more likely to work toward mastery or learning goals while other students were more likely to be content with performance goals. One possible explanation is that it may be highly influenced by one's implicit understanding or beliefs about intelligence. Carol Dweck (1999) explained it well in her book about self theories. She contended that people tend to either see intelligence as something which is fixed and unchangeable or they view intelligence as a malleable quality that can be changed with effort and persistence toward learning tasks. Those who view intelligence as a fixed quality are termed entity theorists because they believe that it is a fixed entity. Entity theorists would support the contention that a person is either smart or dumb and that intelligence is a quality such as eye color which cannot be changed by an individual. Incremental theorists, then, are those who understand intelligence to be a characteristic which is malleable. These incremental theorists would think of intelligence as being more like muscle tone which with hard work and persistence can be improved.

The implication of self theory is that it can greatly affect how one approaches learning tasks. If you believe that intelligence is a fixed entity, then when presented with a difficult learning task, you might be more likely to give up if you believe that you do not have the intelligence or ability to learn that particular task. This is often apparent in subjects like mathematics where it is not uncommon to hear students say something like “I can’t do math” or “I just don’t have a math brain”. On the other hand, those with an incremental view of intelligence are much more likely to persist when faced with difficulty, because they believe that they can “get smarter”. According to Dweck (1999), one’s self theory or view of intelligence is not related to ability. Students who are considered high ability or gifted students may be just as likely as students performing below the level of their peers to be entity theorists. These high ability entity theorists typically do very well in school until they get to the point where their learning is challenged. Once these students begin to face more challenging learning tasks, they may come to believe they have reached the limit of their intelligence and may not believe they can improve.

Self theories can also influence a person’s attributions in achievement settings. According to research conducted by Hong, Chiu, Dweck, Lin, & Wan, (1999) entity and incremental theorists differ in their attributions. In one study by Hong et al., students who had been identified as either entity or incremental theorists were asked to list the reasons they failed to successfully complete a difficult math test. The entity theorists gave much more weight to causes such

as ability while the incremental theorists were more likely to attribute failure to their effort.

The implication of the self theories to this current research study relates to how ones' view of intelligence may impact likelihood to seek out help. A logical prediction based on the theory is that incremental theorists would be more likely to seek out help than entity theorists. If one understands intelligence as something which is malleable, then when faced with difficulty, seeking out assistance would seem to be an adaptive and appropriate behavior. On the other hand, someone who holds an entity theory of intelligence when faced with difficulty might be less likely to seek help. This prediction about help-seeking has been supported in a limited number of studies which have looked at self theories and help-seeking. Hong et al. (1999) conducted one study which looked at how entity or incremental theorists would take advantage of remedial assistance. In the study involving Chinese students attending an English language university in Hong Kong, students were asked whether they would be willing to take remedial English courses outside of their regular course work. Among those students with the weakest English skills, students holding an incremental view of intelligence were found to be much more likely to desire remedial English than those who were entity theorists.

Attribution Theory

The basis of attribution theory of motivation is the question of why. Schunk (2000) noted that students may ask questions which are intended to

seek out causes for success or failure. A student will seek to find out to whom or to what to attribute their success or failure. Bernard Weiner (1985) and his colleagues are given credit for much of the development of attribution theory. Weiner's model of attribution theory involved three dimensions. The first dimension concerned whether attributions were internal or external to the individual. For example, a student might attribute his failure to effort which is internal or teacher bias which is external. The second dimension of Weiner's model involved relative stability of the attribution. A more stable attribution for a student's success would be ability while a less stable attribution would be mood or emotional state. Finally, Weiner's model involved a third dimension which was the controllability of attributions. Students might attribute their success or failure to something which they can easily control such as their effort or something under which they have no control such as luck.

These dimensions of attributions in the model have differing consequences according to Schunk (2000). The stability of an attribution will most likely affect one's expectancy of success. If a student feels that the causes of success are attributable to stable factors, then he would have higher expectations of future success than if he had attributed success to unstable factors that would be more likely to change in the future. The second dimension of attribution theory which involves internal versus external causes would influence affective reactions to success. Success attributable to internal causes would likely lead to feelings of pride, while failure attributed to internal factors

would lead to shame. Attributing success or failure to external factors would lessen both pride and shame. The final dimension of Weiner's model, controllability, may have the most important outcomes. When students attribute success to factors which they feel that they can control, they are more likely to engage in academic tasks and persist through difficulty.

The application of this theory to help-seeking is most apparent in the final dimension of controllability. Students who attribute either their success or failure in achievement tasks to controllable factors would seem to be more likely to seek out help. Ames (1983) noted several studies which provide an empirical basis for the linkage between student attributions and likelihood to seek out help. He noted that students tend to have one of two patterns of attributions which either lead to or discourage help-seeking. Help-seeking is more likely for students who base attributions on internal factors such as effort. Students are less likely to seek help who attribute success to external factors which seem to be out of their control. In a study of college students, Ames and Lau (1982) looked at attitudes toward and attendance at review sessions for students who had scored low on the first examination. Students who attributed their failure to perform well on the first examination to external and uncontrollable factors were much less likely to attend the review sessions than those low performing students who attributed their failure to lack of effort.

In a study by Magnusson and Perry (1992), the researchers found that students would use different help-seeking methods depending on the type of

learning situation and their own typical attributions. In this study, university students were put into a task or performance goal learning situation and then an ego or mastery learning situation to see how different groups of students would access help. The students whose attributions were more based on effort tended to use instrumental help-seeking strategies in both types of learning tasks. The students whose attributions were more based on ability had very different strategies depending on the situation. In the task-involved learning situations these students were actually less likely to use executive help-seeking strategies than the effort attribution students. However, in the ego-involved learning condition, the ability attribution students had a very strong proclivity to use executive help-seeking. One explanation for this may be that the students who tended to attribute ability as the primary cause of their success and failure were more threatened in the ego-involved learning situation. Use of executive help-seeking increased their likelihood of success and helped protect them from exposing lack of ability to others. The students who attributed success and failure to effort would not have felt threatened in the same way.

Self-efficacy

In achievement situations, a person's beliefs about his or her likelihood of success or self-efficacy can be an important component of motivation. Schunk (2000) noted the distinction between self-efficacy and self-concept. While self-concept or self-esteem is a more or less global perspective, self-efficacy is domain specific. A person can have high self-efficacy in reading, but low self-

efficacy in mathematics. Self-efficacy should also be distinguished from outcome expectation. A student may have high self-efficacy in mathematics, but because he has not properly studied for a specific test have very low outcome expectations. Conversely, a student could have high outcome expectations because they belief a task will be rather simple, but have low self-efficacy in that domain.

The question then is how self-efficacy relates to likelihood to seek out help. Ryan, Gheen, and Midgley (1998) studied help-seeking in middle and high school students and found that students who felt less efficacious about their academic ability were less likely to seek out help when they needed it. They found that this especially true for boys. Karabenick (2003) also found that low self-efficacy was positively related to avoidance of help-seeking; however, his findings illustrate the complexity of this particular dimension of motivation. He found that while self-efficacy was positively related to instrumental help-seeking, that there was a slightly negative correlation between self-efficacy and executive help-seeking. One possible explanation for this could be that students with low self-efficacy are more likely to use executive help-seeking strategies. Instrumental help-seeking implies a certain level of confidence to only ask for enough help to complete a task alone. Students with low self-efficacy might be unwilling or even unable to effectively use instrumental help-seeking strategies.

Intrinsic and Extrinsic Motivation

Intrinsic and extrinsic motivation have commonly been thought of as mutually exclusive constructs (Covington and Mueller, 2001). This concept is reinforced by measures of intrinsic and extrinsic motivation source which require a forced choice (Stipek, 2002). Conceptualizing intrinsic and extrinsic motivation as distinct constructs may provide a better picture of what motivates students to learn. Pintrich, Smith, Garcia, and McKeachie (1991) treat them as separate scales in the MSLQ. Their conception of intrinsic and extrinsic motivation in academic achievement settings is that they are based on a student's goal orientation. Intrinsic goals parallel with mastery or learning goals, while extrinsic motivation are related to performance or task goals. Both intrinsic and extrinsic motivation have been found to be positively related to self-regulated learning and negatively related to academic procrastination (Brownlow & Reasinger, 2000).

There have not been many studies which have looked specifically at intrinsic and extrinsic motivation and help-seeking behavior. In his 2003 study, Karabenick did note a significant correlation between intrinsic motivation and help-seeking. He also looked at executive versus instrumental help-seeking approaches and found the relationship between intrinsic interest and both types of help-seeking to be roughly the same. Interestingly, even though Karabenick used the MSLQ for his study and it contains an extrinsic motivation scale, he did

not explore the relationship between extrinsic motivation and help-seeking behavior.

Newman (1998) noted that the relationship between intrinsic and extrinsic motivation is complex and that more research needs to be done in this area. He also noted that intrinsic and extrinsic motivation have usually been discussed in the context of achievement goals. He suggested that research into social goals could help develop our understanding of help-seeking processes.

Research into motivation and help-seeking seems to offer a great deal of promise in helping academic administrators understand why certain students will seek out help and others will not. Motivational constructs are by their nature complex and the relationships among these different motivational theories and help-seeking processes are also complex.

SUPPLEMENTAL INSTRUCTION

As previously discussed, higher education institutions have developed a number of academic assistance programs to improve student retention and facilitate student success. Two common approaches to academic assistance have been to teach generalized study skills or to provide tutoring for specific courses. Both of these approaches have typically been implemented using a medical model (Martin & Arendale, 1993). In this medical model, students at risk for failure must be identified or must self-refer for treatment. The flaw in this approach is the difficulty of identifying students in need of assistance in the

crucial first few weeks of college. SI was developed as an alternative to the medical model.

The Supplemental Instruction Model

In 1972, administrators at the University of Missouri, Kansas City (UMKC) sought to address the poor retention of minority students in their schools of medicine, pharmacy, and dentistry (Widmar, 1994). A graduate student by the name of Deanna Martin was hired for an assistantship and given the task of addressing this issue. After researching academic assistance programming at other universities, she decided the key to addressing the problems at UMKC was to apply study skills instruction to specific content. The first pilot SI program began in 1973 in the school of dentistry. Within a few years, the program had expanded to the medical and pharmacy schools and eventually into undergraduate courses in the arts and sciences. After receiving certification as an *Exemplary Educational Program* by the U.S. Department of Education, UMKC began national and eventually international dissemination of the SI model (Widmar, 1994).

Unlike the medical model described above, SI does not target high-risk students, but rather targets high-risk courses (Martin & Arendale, 1993; Arendale, 1994). High-risk courses targeted by SI are usually courses with large enrollment, high attrition, and low grade distributions. Typically, courses are defined as high-risk if they are traditionally difficult courses with 30% or higher rates of D, F, and withdrawals, although identification of high risk courses is

often an institution specific determination (Arendale, 1994). By targeting high-risk courses, SI avoids the stigma often associated with remedial programs for high-risk students. It also allows for proactive rather than reactive assistance to be provided to students.

Once a course has been identified as being high-risk, the SI program will hire a peer facilitator or SI leader to attend the course lectures and provide regularly scheduled out-of-class study sessions for the students enrolled in the targeted course (Arendale, 1994). SI leaders are usually undergraduate students who are chosen because they possess excellent content mastery and good communication skills. SI leaders must maintain good grades and are required to have successfully completed the targeted course. SI leaders receive extensive training in collaborative learning methods, study skills, and facilitation of discussion. They are expected to serve as a model student by sitting near the front of class, taking notes, and attending every class session.

SI sessions are usually offered free of charge to students and are designed to facilitate active interaction among the students who attend. The model calls for integration of study skills and course content. SI participants should not be passive receivers of information, but should be actively engaged in the learning process. SI leaders are trained to avoid relecturing course content.

Another important component of the SI model is the role of the SI supervisor. Supervisors are typically professional staff or faculty who have

expertise in learning theory and study skills training. They meet regularly with SI leaders and provide on-going training. They are also responsible for providing administrative support for the SI program. Faculty members in targeted courses are not required to be directly involved with SI leaders, but a close relationship between the SI leader and the faculty member has been found to be beneficial to the success of the SI program (Arendale, 1994). Congos (2003) noted that the role of the SI supervisor is crucial in maintaining the SI model and ensuring that the SI leader provides effective help to students who attend their sessions.

SI on many campuses is utilized as part of a comprehensive effort to impact student retention. Boylan (1999a) noted that SI was an effective alternative to remedial education and that SI had been proven to be effective with developmental students. Congos (2002) noted that the SI model is consistent with Arthur Chickering's 7 Principles for Good Practice in Undergraduate Education.

Effectiveness of Supplemental Instruction

In the 30 years since SI began, there has been a great deal of research and evaluation of SI. Most of the research has been focused on short term success. This research has allowed the National Center for Supplemental Instruction at UMKC to have three claims validated by the U.S. Department of Education (Center for Supplemental Instruction [CSI], 2000):

> **Claim 1**: Students participating in SI within the targeted historically difficult courses earn higher mean final course grades than students who

do not participate in SI regardless of ethnicity or prior academic achievement.

Claim 2: Regardless of ethnicity and prior academic achievement, students participating in SI within targeted historically difficult courses succeed at a higher rate (withdraw at a lower rate and receive a lower percentage of D or F final course grades) than those who do not participate in SI.

Claim 3: Students participating in SI persist at the institution (reenrolling and graduating) at higher rates than students who do not participate in SI. (CSI, 2000)

Research done at other institutions has largely been consistent with these claims. For example, a study done at a large state university with both conditionally admitted and traditional college students showed positive grade differences in the targeted courses for students who participated in SI (Ogden, Thompson, Russell, & Simons, 2003). This mirrors claim number one. Two studies of conditionally admitted students have found that those who participated regularly in SI were more likely to gain full admission to the university and reenroll in subsequent semesters than conditionally admitted students who did not participate in SI (McGee, 1998; Ogden, Thompson, Russell, & Simons, 2003). A similar study with high-risk students found that students who were ranked in the bottom quartile of college entrance examination scores who

participated in SI were retained at a higher rate and made higher course grades than non participants (Blanc, DeBuhr, & Martin, 1983). A study of SI in mathematics had similar findings. Students who participated in SI had higher final course grades and this difference was most dramatic for students who entered the course with lower SAT scores (Kenney & Kallison, 1994). Congos (1998) found that SI participants had higher course grades in introductory biology than students who did not attend SI in spite of the fact that the two groups SAT scores and predicted grade point average were not significantly different.

An oft-cited criticism of SI has been that self-selection bias is the reason for the positive grade differences between SI participants and non-participants. One way to address this concern has been to look at differences between SI participants and non-participants on several entering characteristics. If the two groups of students do not differ significantly, then the claim that only the good students attend SI can be dismissed. In a study by Congos and Schoeps (1993), the authors found that SI participants and non-participants were not significantly different with regard to SAT scores, predicted GPA, or high school rank. In spite of the similarities, there were differences in the two groups on final course grades with SI participants having significantly higher final course grades than non-participants.

Self-selection bias was also addressed in a clever study by Gattis (2002). In his study, students were surveyed prior to the semester to determine their

interest in and availability to attend SI sessions. Students who were interested in SI, but who had a time conflict with all scheduled sessions were placed in a motivational control group. Students who indicated that they were available to attend SI were grouped according to their interest. At the end of the semester, final course grades for students in the motivational control group who could not attend SI, but would have been willing to do so were significantly lower than those of students who did attend SI.

SUMMARY OF THE REVIEW OF THE LITERATURE

The purpose of this chapter was to set the stage for this dissertation study by reviewing research into academic help-seeking and the development of the SI model. The literature into help-seeking in non academic domains is rather extensive and there is a growing body of literature into academic help-seeking. Within the academic help-seeking literature, the vast majority of studies have been conducted with primary and secondary students. The few studies with college students have primarily been survey research in which students have been asked to self-report frequency and type of academic assistance. This study has been designed to expand the research literature by looking at actual help-seeking practices in the form of engagement in SI. The SI program provides an excellent “laboratory” to study help-seeking because it is bereft of the usual remedial stigmas that academic assistance programs often carry. It is also widely available and accessible to almost every student enrolled in the targeted courses.

Students entering colleges today are more often than not thrust into courses for which they are not fully prepared. In order for higher education administrators to best serve these students, it is important to understand which students are most likely to seek out help when they encounter difficulty. In his book, *Making the Most of College: Students Speak Their Minds,* Richard Light (2001) quoted an upperclassman who expressed regret at having not sought help when it was needed. This student in some respects highlights what can be learned from this study:

> My message to other students is simple. Unending help is available, but you have to ask for it. I learned an important lesson. Don't keep academic problems a secret. Unfortunately, it took me far too long to learn it. I hope others with my dilemma figure this out more quickly. (p. 34)

CHAPTER III

METHODOLOGY

The purpose of this study was to determine how cognitive, demographic, and motivational factors could be used to understand help-seeking behavior in college students. Specifically, the study examined engagement in Supplemental Instruction of undergraduate students at Texas A&M University. An additional purpose of the study was to determine the efficacy of SI. The following research questions were addressed in this study:

1. What is the relationship of the demographic variables with engagement in SI?
2. What is the relationship of the cognitive variables with engagement in SI?
3. What is the relationship of the motivational variables with engagement in SI?
4. What is the relationship of level of SI engagement with success in the targeted courses?

This chapter outlines the methodology used to address the purpose of this study and to answer the research questions. The chapter includes a discussion of the population and sample, a description of the instrumentation, details about data collection, and a brief discussion of the statistical analysis used in this study. A more detailed discussion of the results of this analysis will be explicated in the next chapter.

POPULATION

The population for this study was undergraduate students at Texas A&M University who were enrolled in at least one course for which SI was available. During the spring 2004 semester, the SI program employed a total of 70 SI leaders. Each SI leader was assigned to one or more sections of a given course. In cases where one professor taught multiple course sections, only one SI leader was assigned to cover every section taught by the professor. The total enrollment in all the courses for which SI was available was 19,589. This total duplicated the count for students enrolled in multiple courses for which SI was available. The unduplicated count which does not double count students enrolled in multiple courses was 14,025. There were 3,750 students who were enrolled in two course sections for which SI was available and 879 students who were enrolled in three or more SI-supported courses. SI support was available in 37 different courses.

The sample for the study consisted of students enrolled in randomly selected SI courses during the spring 2004 semester. In order to make inferences based on the data, the following procedure was implemented to draw a random sample. Hinkle, Wiersma, and Jurs (1998) noted that determination of proper sample size is not something for which there is always a definitive answer. In addition, this study is primarily exploratory in nature and several different methods were used in the data analysis. However, there were some basic guidelines which proved helpful in determining the proper sample size.

During the proposal stage of this study, it was determined that the data would most likely be analyzed using multiple regression. Stevens (2002) recommended for regression studies in the social sciences that the sample include approximately 15 participants for each independent variable. The largest number of predictor variables that had been planned for any of the regression models was 13. The proper sample size based on Steven's recommendation was 195. The dependent variable for the regression equations was to be SI engagement. The primary focus for this study was intended to be the characteristics of students who were highly engaged in SI. For this reason, the final sample needed to have approximately 195 students who would have attended SI at least six times during the semester. Historical SI data collected by the Center for Academic Enhancement (2004) indicated that approximately 18% of students enrolled in SI targeted courses at Texas A&M will attend at least six sessions. The expected response rate for the survey was 45%. In order to end up with 195 frequent participants in the final sample, the survey needed to target approximately 2,400 students.

After the data was collected, the researcher, in consultation with members of the advisory committee decided to use methods other than multiple regression to analyze the data. Fortunately, the sample size of the final data set was still within an acceptable range for the methods of analysis that were eventually selected. For the final analysis of data, the study participants were divided into three groups based on their level of engagement in SI. The three

groups were non-SI participants, students who had low levels of SI engagement, and students who were highly engaged in SI. For a three group multivariate analysis, Stevens (2002) provides a table for determination of *a priori* sample size. Had this analysis decision been made *a priori*, the proper sample size for the study would have been to have groups with at least 210 members. This determination was made based on a small expected effect size, an alpha value of .05, and a three group design. The original decision to plan for approximately 195 frequent SI participants still worked well for the revised data analysis methodology.

Once this total was determined, the course sections and total enrollments were entered into an Excel spreadsheet. The order of courses was randomized by assigning a number to each course using the randomization function in Excel and then reordering the course sections based on the random numbers. This procedure was repeated twice to ensure randomization. Courses were selected beginning at the top of the randomly ordered list of SI courses until the target enrollment figure of at least 2,400 was reached. This total was achieved once eight SI course sections had been selected. The total enrollment in the selected courses was actually 2,520. This total double or triple counts 110 students who were enrolled in multiple sections. There were 2,297 students enrolled in only one of the selected courses, 107 students enrolled in two of the eight courses and three students enrolled in three of the courses. The unduplicated total of students in the sample was 2,407. The courses chosen for the study included

Biology 113: *Introductory Biology*, Biology 114: *Introductory Biology*, Chemistry 102: *Fundamentals of Chemistry II*, Chemistry 228: *Organic Chemistry II*, two sections of History 106: *History of the United States*, Horticulture 201: *General Horticulture*, and Political Science 206: *American National Government*.

The survey entitled the "Supplemental Instruction Motivation Questionnaire" was made available on-line (see Appendix A) to the 2,407 students enrolled in the courses chosen for the sample. A total of 1,061 completed and identifiable surveys were submitted to the study website. Based on the unduplicated total number of students, this represented a response rate of 44.1%. The researcher subsequently determined based on a concern about meeting statistical assumptions to eliminate the 110 students who were enrolled in multiple sections from the majority of data analyses. A more thorough discussion of this decision can be found in the "Data Analysis" section of this chapter. The revised sample included 2,297 students. Of this total, 1,003 students submitted surveys for a revised response rate of 43.7%. While this response rate is slightly lower than the expected response rate of 45%, the final sample size was adequate for subsequent data analysis.

INSTRUMENTATION

Some of the data for this study were collected from archived student records. This included SAT scores, high school percentile ranks, gender, ethnicity, major field of study, classification, and student grades. SI attendance data for the study were collected from the records of the Center for Academic

Enhancement. In order to provide for ongoing evaluation and assessment of the SI program, all students who participate in SI are asked to sign an attendance sheet at each session. Attendance tallies are subsequently entered into a database which is used to generate end of semester statistical reports. These reports are provided to course instructors and campus administrators and are used for program assessment efforts. The data are reported in aggregate form to protect the privacy of individual students and to ensure that SI attendance is not used by the course instructor to influence course grades.

For the purposes of this study, the attendance data also included a participation rating assigned by the SI leaders to the attendees after each session. The rating scale was developed by a panel of SI leaders and SI supervisors. The rating scale was pilot tested during the fall semester by an SI leader who was not part of the final study. The four-point rating scale was then refined for use in the final study. The assignment of SI leaders to specific course sections was made by the SI Program Coordinator and was not influenced by this research study. The SI leaders who had been assigned to the eight randomly selected SI sections were trained prior to the semester to rate student participation using the four-point scale.

The following descriptions were given to the SI leaders to help them rate the students who attended their sessions:

1. A rating of one was given to SI attendees who were completely uninvolved in sessions. This included students who signed in,

but left after only a few minutes, students who were reading material not related to the SI course, students who were distracted or inattentive, and students who fell asleep in SI sessions.

2. A rating of two was given to students who were attentive, but quiet during the sessions. These students did not answer questions or otherwise participate actively in the sessions.
3. A rating of three was assigned to students who were moderately engaged in the SI sessions. These were students who were willing to answer questions or participate in activities planned by the SI leaders, but did not initiate questions.
4. A rating of four was given to students who were actively involved in all aspects of the SI session. These were students who took initiative by asking questions or volunteering to participate in learning activities.

At the end of the semester, the total number of sessions attended was multiplied by the average participation rating given to each student to determine each student's engagement score. This engagement score was entered into the database and later used in data analysis.

The on-line survey provided the rest of the data used for the study. The first three questions in the survey were used to provide demographic data for the study. The first two of these questions asked students to provide information

about the educational attainment of their parents. Students were asked to identify the highest level of educational attainment for both their father and their mother using the following scale:

1. Did not finish high school
2. High school graduate or GED, but did not attend college
3. Attended some college
4. Bachelor's degree
5. Master's degree
6. Doctorate or professional degree
7. Unsure

A third demographic question was designed to determine the socio-economic status (SES) of the survey participants. The students were asked to estimate the total income of their parents. The income ranges chosen for the survey were based on estimated 2002 household income data provided by the United States Census Bureau (DeNavas-Walt, C., Cleveland, R., & Webster, B.H., 2003). The income upper limits for each quintile were rounded to the nearest $5,000 increment to help eliminate confusion. These ranges divide average household income into the following six categories:

1. Less than $20,000 (lowest quintile)
2. $20,000 to $34,999 ($2^{nd}$ quintile)
3. $35,000 to $49,999 ($3^{rd}$ quintile)
4. $50,000 to $79,999 ($4^{th}$ quintile)

5. $80,000 to $150,000 (highest quintile not including top 5%)
6. More than $150,000 (top 5% of household incomes)

The data for the motivational variables was also included in the on-line survey and came from scale scores on the Motivated Strategies for Learning Questionnaire (MSLQ) and from a brief questionnaire to determine entity versus incremental view of intelligence. The MSLQ was developed by researchers at the University of Michigan in order to assess self-regulation and other factors related to academic motivation (Pintrich, Smith, Garcia, & McKeachie, 1993). For this research project, students' scores on the following scales were used as a measure of self-regulation and motivation: intrinsic and extrinsic motivation, task value, control beliefs, and self-efficacy. The on-line survey also included the following learning strategy scales: organization, metacognitive self-regulation, effort regulation, peer learning, and help-seeking. Several scales which are part of the MSLQ were not used for this study. These included test anxiety, rehearsal, elaboration, critical thinking, and time and study management.

The motivational scales in the MSLQ have their theoretical basis in cognitive learning theory (Pintrich, Smith, Garcia, & McKeachie, 1993). Brief descriptions of each scale used in this study are provided below. The specific items used for each of the scales included in the survey are detailed in Appendix B:

1. *Intrinsic Motivation*: Based on goal orientation theory, this scale measures a student's perception of his or her reasoning for engaging in learning tasks. A high scale score on intrinsic motivation indicates the student has a mastery goal orientation for learning and is motivated by intellectual curiosity.
2. *Extrinsic Motivation*: This scale is also related to goal orientation. Students with high extrinsic motivation scores are motivated to learn by outside influences and may perceive that learning is a means to an end. Examples of extrinsic goals for learning are recognition, grades, or other rewards not directly related to the learning task itself.
3. *Task Value*: In contrast to goal orientation, task value is based on the student's perception of the relative value of the learning task. This scale is related to the attribution theory of motivation. Students who score high on this scale perceive that the course they are taking is important and interesting.
4. *Control of Learning Beliefs*: This scale measures whether students perceive that their efforts in engaging in the learning task will have a positive effect. A high score on this scale reflects the student's belief that he or she has control over their learning. By contrast, a low score would indicate the student's belief that someone or something else is to blame if learning does not occur.

5. *Self-efficacy*: The student's perception of his or her likelihood to succeed is measured by this scale. It also measures the student's self-appraisal of ability to succeed in a specific learning task. High self-efficacy indicates the student is confident of both success and ability. Low self-efficacy would be indicative of low confidence and low expectancy of success.
6. *Organization*: Students who score high on this scale have indicated their tendency to use organizational strategies in preparing for and studying for their classes. Use of good study strategies indicates commitment to learning.
7. *Self-regulation*: This scale measures the students use of metacognitive strategies for learning such as planning, monitoring, and regulating their study behavior. The questions for this scale focus on specific behaviors that indicate self-regulated learning.
8. *Effort regulation*: The student's perception of his or her ability to work diligently in the face of distractions or setbacks is measured on this scale. High effort regulation also reflects the student's willingness to persist through difficulty.
9. *Peer learning*: This scale measures the student's willingness to collaborate with his or her peers in the process of learning. A high peer learning score would indicate that the student sees value in working with

other students while a low score would indicate that the student prefers working alone.

10. *Help-seeking***:** Willingness to seek help and identification of sources of help are both measured on this scale. Students who score high on this scale have indicated that they are willing to seek help if it is needed and have identified potential sources of help (Pintrich, Smith, Garcia, & McKeachie, 1993).

Adapting the MSLQ by selecting particular scales is considered to be an acceptable use of the instrument according to the developers of the MSLQ (Pintrich, Smith, Garcia, & McKeachie, 1991). Permission to use the MSLQ and to develop an on-line version for this study was obtained via e-mail correspondence with Dr. Paul Pintrich in July of 2003. Students were asked to indicate agreement or disagreement with each of the MSLQ items on a seven-point Likert-type scale with one signifying “not at all true of me” and seven indicating “very true of me” (see Appendix A). Scale scores were calculated by averaging the item scores for each set of questions. Missing data was replaced with a four, the mean score for each item. Reverse scored items (indicated in Appendix B) were calculated by subtracting the item score from eight. Calculation of the scale scores was done after the raw data had been imported into SPSS for Windows version 11.5.1 (Statistical Package for Social Sciences, 2002).

The reliability of the MSLQ has been studied through confirmatory factor analysis and standard reliability tests. Confirmatory factor analysis done on the MSLQ resulted in a GFI index of .77, an AGFI of .73, and an RMR of .07 (Pintrich et al., 1993). These "goodness of fit" indices are all well within acceptable levels of reliability. Reliability coefficients on the separate MSLQ scales ranged from a low of .52 on the help-seeking scale to a high of .93 on the self-efficacy for learning scale. Ten of the fifteen scales had coefficient alphas of .70 or higher indicating moderate to good internal reliability (Pintrich et al.). The reliability coefficients for the current study ranged from a low of .67 for help-seeking to a high of .94 for self-efficacy for learning (see Table 1) for the scales included in the on-line survey.

Pintrich et al. (1993) also looked at the predictive validity of the MSLQ. The instrument was found to have a moderate correlation with final course grades in a sample of 380 college students enrolled in mostly four-year universities in 1990. Six scales had an *r* of at least .25 with final course grades (Intrinsic goal orientation; *r* = .25; Self-efficacy; *r* =. 41; Test anxiety; *r* = .27; Metacognition; *r* = .30; Time and study environment management; *r* = .28; Effort regulation; *r* = .32). Pintrich et al. also looked at construct validity and reported the MSLQ to be a valid measure of cognitive and motivational constructs. Moak (2002) found concurrent validity for six of the MSLQ scales with similar scales on the Learning and Study Strategies (LASSI) inventory.

TABLE 1. Internal Reliability of MSLQ Scales

MSLQ Scale	Items	Cronbach's Alpha for present study *	Cronbach's Alpha in test manual **
Intrinsic Goal Orientation	4	.78	.74
Extrinsic Goal Orientation	4	.70	.62
Task Value	6	.89	.90
Control of Learning Beliefs	4	.77	.68
Self-efficacy	8	.94	.93
Organization	4	.69	.64
Metacognitive Self-regulation	12	.75	.79
Effort Regulation	4	.73	.69
Peer Learning	3	.74	.76
Help-seeking	4	.67	.52

* n = 1003; ** n= 380

One additional motivational variable was derived from a series of questions included in the survey which were used to determine students' understanding of intelligence. The questions were designed to determine whether the students viewed intelligence as fixed or malleable. Respondents who had an implicit understanding of intelligence as some inherent unchangeable quality like eye color were labeled as entity theorists. Those who viewed intelligence as malleable were considered to hold an incremental theory of intelligence. As suggested by Dweck (1999), the following questions were used to determine whether the students were incremental or entity theorists:

1. You have a certain amount of intelligence and you can't really do much to change it.
2. Your intelligence is something about you that you can't change very much.

3. No matter who you are, you can significantly change your intelligence level.
4. To be honest, you really can't change how intelligent you are.
5. You can learn new things, but you can't really change your basic intelligence.

Students were asked to indicate their agreement or disagreement with these questions on a six-point Likert-type scale using the following labels also suggested by Dweck, 1999:

1. Strongly Agree
2. Agree
3. Mostly Agree
4. Mostly Disagree
5. Disagree
6. Strongly Disagree

The final scale score for view of intelligence was based on the mean item score for the five intelligence theory questions. All questions except for the third question represented an entity theory of intelligence. Question number three reflected the incremental theory and was reverse scored. The higher students scored on this scale, the more they disagreed with or rejected the entity theory of intelligence. Therefore, a high "view of intelligence" scale score identified a student as having an incremental theory of intelligence. This methodology of determining orientation toward intelligence has been a generally reliable

measure in several studies (Dweck, Hong, & Chiu, 1993; Hong et al., 1999). Hong et al. reported high test-retest reliability (r = .80, N = 62, over a 2-week period) and high internal reliability (alphas ranging from .94 to .98 for samples ranging from 32 to 184) using these questions. The internal reliability for the present study was an alpha of .92 based on the sample of 1,216 valid cases.

It should be noted that the view of intelligence variable and the MSLQ scale scores used slightly different Likert-type scales. In addition, the MSLQ scales were derived from varying numbers of test items. For these reasons, it was determined that all eleven of the motivational variables should be converted to standardized scores. Using SPSS, the scale scores were converted to Z scores for subsequent analysis.

PROCEDURE

Using the methodology described above, a random sample of SI course sections was selected for inclusion in the study. Once the SI course sections were chosen, the researcher met with each course instructor to inform them about the study and to solicit help in getting out information to the students. In order to help ensure a high response rate for the survey, instructors were asked to allow the researcher class time to hand out information flyers about the study (see Appendix C). All of the instructors were willing to grant class time during the first week of the semester for the researcher to give out this information. In addition, the researcher requested that students be given bonus points in the course as an incentive to participate in the study. Two of the eight instructors

agreed to give bonus points and this is reflected in the higher response rates for these two courses (see Table 2). The researcher also requested that the instructors include information about the study and survey on their course syllabi and websites. Four of the instructors did agree to put information on their syllabus and one instructor put a prominent notice on his course website. To remind them about the syllabus notice and to confirm the class visit, instructors were sent an e-mail message during the first week of January prior the beginning of the semester with suggested wording for their syllabi. A sample of this e-mail message is included in Appendix C.

TABLE 2. Response Rate Summary

Course	Enrollment	Completed Surveys	Response Rate
Biology 113	297	80	26.9%
Biology 114	598	226	37.8%
Chemistry 102	282	107	37.9%
Chemistry 228 *	199	177	88.9%
History 106: 502 *	144	134	93.1%
History 106: 515	150	42	28.0%
Horticulture 201	340	131	38.5%
Political Science 206	510	224	43.9%
Total	2520	1121	44.5%

*Students were offered bonus points to participate in the study.
Note: Students enrolled in multiple course sections are duplicated in the total.

During the class visits conducted during the first two days of the spring semester, students were given a brief introduction to the study and given both written and verbal information about how to complete the on-line survey. Students were encouraged to complete the survey whether or not they intended to participate in SI sessions. Instructors for each of the selected SI courses were contacted via e-mail at the end of the second week of classes. This e-mail

message gave them an update on the responses to the survey in their class, thanked them for participation, and requested that they encourage their students to participate in the survey by sending an e-mail reminder to the students in their class. It was hoped that students would respond positively to encouragement by their professors. A sample of this e-mail message is in Appendix C. This request was not sent to the two instructors who had offered bonus points for participation since the response rate from these two classes was already quite high. Of the remaining six instructors, three of them agreed to send the e-mail reminder. Students from the other three courses were sent an e-mail reminder by the researcher (Appendix C).

By the beginning of March, approximately 800 surveys had been submitted representing a response rate of about 29%. In addition, the frequency of submissions had slowed to only a few per day. After spring break, the researcher sent an e-mail reminder to every student who had not yet completed the survey (Appendix C). This reminder proved effective and an additional 250 surveys were submitted over the following two weeks. All the surveys had been submitted by the 15th of April although the website remained open until the final day of the semester.

The informed consent procedures were conducted in accordance with Institutional Review Board (IRB) policies for research with human subjects. In order to ensure that students who completed the survey were giving informed consent to participate in the study, the study website was designed so that

students had to affirm having read the information sheet before they could enter the actual survey (see Appendix D). The students were also asked to enter their names and e-mail addresses into the survey in order to verify the identity of participants. Surveys which were submitted without the identifying information were deleted from the database.

DATA ANALYSIS

The on-line survey was designed in such a way that student responses were immediately saved into a secure, password-protected server maintained by the College of Education and Human Development. The data was then downloaded into an Excel spreadsheet and saved on the researcher's personal computer. This allowed the researcher to keep the data confidential to protect the privacy of all participants. The other primary source of data for the study was attendance data collected and maintained by the Center for Academic Enhancement (CAE). The researcher received permission from Dr. Karon Mathews, Executive Director of the CAE, to use this data for the study. SI attendance data was collected by the SI leaders at each session and then entered into an Access database by the researcher. The attendance variable was calculated as the total number of SI sessions attended during the semester in the targeted course. The total number of SI sessions offered throughout the semester in the selected SI sections ranged from 35 to 41 (see Table 3). In addition, a mean participation score for each participant was calculated using the participation ratings assigned after each session by the SI leaders. The total

number of sessions attended was multiplied by the mean participation score to derive each student's engagement score for the semester.

TABLE 3. Total Number of SI Sessions Offered by Course

Course	Leader	Total Sessions
Biology 113	Lauren	39
Biology 114	Ify	40
Chemistry 102	Karen	39
Chemistry 228	Jennifer	41
History 106: 502	Whitney H.	35
History 106: 515	Whitney A.	38
Horticulture 201	Susan	36
Political Science 206	Stephen	40

Some of the data in the Access database were imported from a file provided by the Texas A&M Student Information Management System (SIMS) office. This included the students' gender, ethnicity, classification, major fields of study, SAT scores, high school ranks, cumulative and semester GPA's, and final course grades in the SI targeted course. Final course grades at Texas A&M are assigned using letter grades based on a four point system. Because letter grades show less discrimination among the students in the class, the researcher requested that the course instructors provide a numerical final grade for the students. All but one of the instructors agreed to this request and provided the grade data at the end of the semester.

Once the data entry was completed, the SI attendance file was merged with the survey data. This data was then exported to SPSS for data analysis. The data analysis was designed to address each of the research questions and to provide descriptive data to help in understanding the nature of the data.

Because this study was not based on an established theoretical model, preliminary data analysis was done to explore the variables. One concern was that since the survey return rate based on the revised sample was only 43.7%, that the results of the survey may not have been representative of the entire sample due to self-selection bias. Several preliminary analyses were conducted to test for this and are discussed in detail in Chapter Four.

In addition, preliminary analysis was done on each variable to determine if the data met the proper statistical assumptions. An important statistical assumption in almost all inferential statistical methods is the independence of observations (Stevens, 2002). As discussed previously, there were 110 students in the sample who were enrolled in more than one of the eight courses selected for the study. These students represented a threat to the independence assumption because each of these 110 students would be counted two or three times in many of the analyses. To measure the impact of including these 110 students, all of the major analyses were conducted both with and without the students who were enrolled in multiple sections. While there were slight differences in critical values and effect sizes, there were no analyses in which including these 110 students reversed the results of a test of statistical significance.

In order to ensure that the independence assumption was met, the researcher decided to eliminate the 110 students who were enrolled in multiple

courses from subsequent data analysis. The revised sample of 2,297 students submitted 1,003 usable survey resulting in a revised response rate was 43.7%.

It was determined that the sample could be reasonably divided into three groups for analysis. The first and largest group consisted of those students who did not attend any SI sessions. The remaining students who did participate in SI were divided into two groups based on their level of engagement. Those students who had a participation score of at least 2.5 and had attended at least 6 SI sessions during the semester were identified as the high engagement group. SI students who had attended SI fewer than 6 times or had a participation score lower than 2.5 were labeled as low engagement.

There were two rationales for using these cutoff points. First, both cutoff scores are near the mean for all students who participated in SI. Secondly, these cutoff scores made practical sense. The cutoff point for number of sessions is based on a pattern the researcher has observed over ten years of working with SI. Many students will use SI as a test review rather than going to SI as a regular study strategy. Students who only attend SI before each test and the final examination are unlikely to attend more than five sessions. Students who attend six or more sessions are likely to be students who have fully embraced SI as a part of their learning strategy. The cutoff point for the participation rating is based on characteristics of the rating scale. A rating of two is indicative of a student who is present and attentive in SI, but is not actively participation. A rating of three implies that the student is actively involved in the session. By

making 2.5 the cutoff score, all students in the high engagement group would have received a rating of three or higher on participation for at least half of the sessions which they attended.

The primary analysis done to address research questions one, two, and three depended on the variables of interest. For the motivational variables, Multivariate Analysis of Variance (MANOVA) analysis was chosen because the scale scores were considered to be interval data. The same analysis was used for the cognitive variables of SAT scores and grade point averages. The demographic variables (parent education, socioeconomic status, gender, and ethnicity) were categorical variables which required the use of non-parametric statistical analysis.

To address the fourth research question, several analyses were run. The students' final grades in the targeted courses were converted to standard scores so that results could be compared across courses. For this analysis, the standard scores were used as the dependent variable and the engagement groups were used as the grouping variable. Because success in college courses can be predicted to some degree by incoming SAT scores and high school ranks as well as prior success in college courses, further analysis was done using these factors as covariates. In addition, comparisons of mean course grades were conducted controlling for motivational factors. Chapter IV will be devoted to explicating the results of the data analysis.

CHAPTER IV

RESULTS

The purpose of this study was to determine how cognitive, demographic, and motivational factors could be used to understand help-seeking behavior in college students. Specifically, the study examined engagement in Supplemental Instruction of undergraduate students at Texas A&M University. An additional purpose of the study was to determine the efficacy of SI. The following research questions were addressed in this study:

1. What is the relationship of the demographic variables with engagement in SI?
2. What is the relationship of the cognitive variables with engagement in SI?
3. What is the relationship of the motivational variables with engagement in SI?
4. What is the relationship of level of SI engagement with success in the targeted courses?

In order to address the research questions, a random sample of eight courses for which SI was available were selected for inclusion in the study. These eight courses had a combined enrollment of 2,520. Because a small subset of students were enrolled in more than one of the targeted courses, the stated total double or triple counted some students. The unduplicated total of students in the sample was 2,407. Based on a concern about meeting the independence of observations assumption, the 110 students who were enrolled

in more than one of the courses selected for the study were eliminated from subsequent data analysis. The revised sample totaled 2,297. Some data collected for the study were available for all 2,297 students. These included background variables such as SAT scores, gender, ethnicity, major field of study, grade point average, and classification. In addition, SI attendance data were available for the entire sample.

Students enrolled in the targeted courses were asked to complete an on-line survey which provided information on several other variables of interest including parent education, socio-economic status (SES), and several motivational variables. A total of 1,003 students in the revised sample submitted completed surveys for a response rate of 43.7%. Because the survey data was not available for those students who did not submit the survey, preliminary data analysis was undertaken to determine whether the survey data could be generalized to the entire sample.

PRELIMINARY DATA ANALYSIS

The purpose of the preliminary analysis was to determine how the data should properly be organized before considering the research questions. The first step of this preliminary analysis was to determine whether the data gathered in the on-line survey could be properly generalized to the students who did not complete the survey. The second part of the preliminary analysis was undertaken to determine whether SI attendance patterns were dependent on the type of course (science or non-science). If the attendance patterns were found

to vary based on the type of course, then it would have been reasonable to analyze the research questions separately for each course type. Because it was determined that the attendance patterns were not dependent on course type, then aggregating the data for subsequent analysis was determined to be a reasonable approach to take.

Preliminary Analysis Based on Survey Groups

The individual cases in this study were divided into four groups for preliminary data analysis. Frequencies for these four groups can be seen in Table 4. The first group consisted of students who had submitted the on-line survey and were also participants in the SI program. The second group consisted of students who submitted a survey, but did not participate in SI. The third group were SI participants who did not submit a survey. Students who did not submit a survey and did not participate in SI comprised the final group. Background data were collected on all 2,297 students in the sample. This background data included SAT verbal scores, SAT math scores, ethnicity, gender, cumulative grade point ratio, major, college affiliation, and classification. In addition, SI attendance data were collected for all students in the sample. The on-line survey provided additional data to address the research questions. This included a measure of socio-economic status, level of parent education, and the motivational variables discussed in Chapter Three.

One of the purposes of this preliminary data analysis was to determine if there were substantive differences between the students who chose to submit

an on-line survey and those who did not submit a survey based on the background variables. If differences had existed, it could have been an indication of self-selection bias on the part of the survey participants. If there were not any differences, then it would be reasonable to infer that the information from the survey could be generalized to the groups of students who did not submit a survey. This preliminary statistical analysis was conducted to determine if there were significant differences between and among the four survey groups. The direction of any detected differences and interpretation of these results is discussed within the context of the appropriate research questions.

TABLE 4. SI Survey Groups Frequencies

	Frequency	Percent
Survey & SI participant	273	11.9
Survey only	730	31.8
SI participant only	289	12.6
Neither SI nor survey	1005	43.8
Total	2297	100.0

The first variable analyzed was SAT mathematics scores. Table 5 contains the descriptive data about SAT math scores for the four groups of students. It should be noted that SAT scores were not available for all 2,297 students in the sample. Transfer students typically do not have SAT scores sent to the university and some students choose to take the ACT instead of the SAT as their entrance examination. These descriptive data indicated that students

who participated in SI had lower mean SAT mathematics scores than students who did not participate in SI.

TABLE 5. SI Survey Groups SAT Math

SI Survey Groups	N	Minimum	Maximum	Mean	Std. Deviation
Survey & SI participant	237	400	800	568.86	75.014
Survey only	642	370	800	589.44	78.177
SI participant only	264	360	770	566.25	76.451
Neither SI nor survey	865	210	800	583.41	83.434
Total	2008	210	800	581.36	80.296

In order to explore this data more thoroughly, one-way analysis of variance (ANOVA) was conducted to determine if there were significant differences in mean SAT math scores among the four groups of students. Table 6 shows the results of the ANOVA comparing the four groups of students with SAT math as the dependent variable. This analysis indicated that there were some statistically significant differences in mean SAT math scores among the groups. In order to determine where the differences lie, post hoc analysis was conducted using Tukey's honestly significant difference (HSD) test. The results of the post hoc analysis in Table 7 indicated that the differences in the groups were related to participation in SI rather than completion of the on-line survey. SI participants who completed the survey were not significantly different from SI participants who did not complete the survey (p = .983). By the same token, SI non-participants who completed the survey were not statistically different from non-participants who did not complete the survey (p = .469). There were,

however, statistically significant differences between SI participants and non-participants. These differences will be explored later in this chapter.

TABLE 6. ANOVA for SAT Math

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	142839.722	3	47613.241	7.456	.000
Within Groups	12797285.162	2004	6385.871		
Total	12940124.884	2007			

TABLE 7. Multiple Comparisons: SAT Math

Tukey HSD

					95% Confidence Interval	
(I) SI Survey Groups	(J) SI Survey Groups	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Survey & SI	Survey only	-20.58(*)	6.074	.004	-36.20	-4.96
	SI only	2.61	7.151	.983	-15.78	21.00
	Neither	-14.55	5.859	.063	-29.61	.52
Survey only	Survey & SI	20.58(*)	6.074	.004	4.96	36.20
	SI only	23.19(*)	5.843	.000	8.17	38.21
	Neither	6.03	4.163	.469	-4.67	16.73
SI only	Survey & SI	-2.61	7.151	.983	-21.00	15.78
	Survey only	-23.19(*)	5.843	.000	-38.21	-8.17
	Neither	-17.16(*)	5.619	.012	-31.61	-2.71
Neither	Survey & SI	14.55	5.859	.063	-.52	29.61
	Survey only	-6.03	4.163	.469	-16.73	4.67
	SI only	17.16(*)	5.619	.012	2.71	31.61

* The mean difference is significant at the .05 level.

SAT verbal scores are summarized in Table 8. Again there were 289 students for whom no scores were available. As was the case with SAT math scores, SI participants had lower mean SAT verbal scores than students who did not participate in SI. One-way analysis of variance (ANOVA) was conducted to

determine if students who participated in the survey were different from students who did not participate.

TABLE 8. SI Survey Groups SAT Verbal

SI Survey Groups	N	Minimum	Maximum	Mean	Std. Deviation
Survey & SI participant	237	270	800	548.23	86.985
Survey only	642	290	800	572.12	79.329
SI participant only	264	290	800	541.78	73.383
Neither SI nor survey	865	318	800	562.04	81.032
Total	2008	270	800	560.97	80.870

Table 9 shows the results of the ANOVA which compared the four groups of students with SAT verbal as the dependent variable. The results indicated that there were some statistically significant differences in mean SAT math scores among the groups. Post hoc analysis was conducted to explore the nature of these differences.

TABLE 9. ANOVA for SAT Verbal

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	216485.920	3	72161.973	11.202	.000
Within Groups	12909088.288	2004	6441.661		
Total	13125574.207	2007			

The results of the post hoc analysis in Table 10 indicated that the differences in the groups were related to participation in SI rather than completion of the on-line survey. SI participants who completed the survey were not significantly different from SI participants who did not complete the survey (p = .806). SI non-participants who completed the survey were not statistically

different from non-participants who did not complete the survey (p = .076). There were, however, statistically significant differences between SI participants and non-participants. These differences will be explored later in this chapter.

TABLE 10. Multiple Comparisons: SAT Verbal

(I) SI Survey Groups	(J) SI Survey Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Survey & SI	Survey only	-23.89(*)	6.100	.001	-39.58	-8.21
	SI only	6.45	7.182	.806	-12.02	24.91
	Neither	-13.82	5.884	.088	-28.95	1.31
Survey only	Survey & SI	23.89(*)	6.100	.001	8.21	39.58
	SI only	30.34(*)	5.868	.000	15.25	45.43
	Neither	10.07	4.181	.076	-.68	20.82
SI only	Survey & SI	-6.45	7.182	.806	-24.91	12.02
	Survey only	-30.34(*)	5.868	.000	-45.43	-15.25
	Neither	-20.26(*)	5.643	.002	-34.77	-5.75
Neither	Survey & SI	13.82	5.884	.088	-1.31	28.95
	Survey only	-10.07	4.181	.076	-20.82	.68
	SI only	20.26(*)	5.643	.002	5.75	34.77

* The mean difference is significant at the .05 level.

The next background variable that was analyzed was ethnicity. Table 11 shows the crosstabulation for the four groups of students based on their ethnicity. This data was based on official university records. It should be noted that Texas A&M has a very large majority White student population and the number of minority students was quite low for all survey groups. Because

TABLE 11. Crosstabulation: Ethnicity by SI Survey Groups

		SI Survey Groups				Total
		Survey & SI	Survey only	SI only	Neither	
African Amer.	Count	8	12	8	28	56
	Expected Count	6.7	17.9	7.0	24.4	56.0
Hispanic	Count	33	59	40	90	222
	Expected Count	26.5	71.0	27.9	96.6	222.0
Asian	Count	14	30	18	36	98
	Expected Count	11.7	31.3	12.3	42.7	98.0
White	Count	216	625	219	834	1894
	Expected Count	226.1	605.7	237.8	824.3	1894.0
Total	Count	271	726	285	988	2270
	Expected Count	271.0	726.0	285.0	988.0	2270.0

of the very small number of students classified as Native American or “other”, students from these two groups were eliminated from this analysis. This decision was made to eliminate problems with low expected frequencies. According to Hinkle, Wiersma, and Jurs (1998) there can be problems associated when expected frequencies in cells are less than five. This is especially problematic with small contingency tables. Chi-square analysis was conducted on this data to determine if there were significant differences among the four groups based on their ethnicity. Table 12 shows the results of the Chi-square analysis for all four groups. The groups were statistically significantly different as to ethnicity at the .05 level (p = .025). In order to explore whether these differences were related to survey participation, additional

TABLE 12. Chi-Square Tests: Ethnicity by SI Survey Groups

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.081(a)	9	.025
Likelihood Ratio	18.421	9	.031
N of Valid Cases	2270		

a 0 cells (.0%) have expected count less than 5.
The minimum expected count is 6.69.

Chi-square analysis was conducted comparing SI participants who completed the survey with SI participants who did not participate in the survey. As can be seen in Table 13, these two groups did not have a statistically significant difference (p = .840). The same was true comparing SI non-participants who completed the survey with SI non-participants who did not submit a survey. These results can be seen in Table 14. The groups did not have a statistically significant difference (p = .339). These results indicated that any differences in ethnicity among the four groups were related to participation in SI rather than willingness to submit a survey. The differences in the groups related to SI participation will be explored later in this chapter.

TABLE 13. Chi-Square Tests Comparing Only SI Participants

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.840(a)	3	.840
Likelihood Ratio	.842	3	.839
N of Valid Cases	556		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.80.

TABLE 14. Chi-Square Tests Comparing Only SI Non-participants

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.364(a)	3	.339
Likelihood Ratio	3.462	3	.326
N of Valid Cases	1714		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.94.

Gender was the next background variable analyzed in the preliminary stage. Table 15 shows the crosstabulation of SI participation groups by gender. Chi-square analysis was used to test for significant differences based on gender

TABLE 15. Crosstabulation: Gender by SI Survey Groups

		SI Survey Groups				Total
		Survey & SI	Survey only	SI only	Neither	
Female	Count	199	476	179	528	1382
	Expected Count	164.3	439.2	173.9	604.7	1382.0
Male	Count	74	254	110	477	915
	Expected Count	108.7	290.8	115.1	400.3	915.0
Total	Count	273	730	289	1005	2297
	Expected Count	273.0	730.0	289.0	1005.0	2297.0

The result of this analysis for all four groups is shown in Table 16. There were some statistically significant differences in the four groups based on gender. Additional Chi-square analysis was done to determine if the differences in the groups were related to whether students submitted a survey. Table 17 shows the Chi-square analysis comparing students who participated in SI and took the on-line survey and students who did not complete the survey, but participated in SI. These results revealed a statistically significant difference in the two groups

TABLE 16. Chi-Square Tests: Gender by Survey Group

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	50.971(a)	3	.000
Likelihood Ratio	51.630	3	.000
Linear-by-Linear Association	49.945	1	.000
N of Valid Cases	2297		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 108.75.

which may indicate some gender bias in the likelihood of students to submit a survey. Table 18 summarizes the Chi-square results for SI non-participants comparing those who submitted a survey to those who did not submit one. Again these results indicated that some gender bias in the survey may exist. In analyzing the results of some of the motivational variables which were only available for survey participants, this possible gender bias was considered as a mitigating factor.

TABLE 17. Chi-Square Tests: Gender by Survey Group (SI Participants Only)

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.693(b)	1	.010		
Continuity Correction(a)	6.232	1	.013		
Likelihood Ratio	6.724	1	.010		
Fisher's Exact Test				.011	.006
Linear-by-Linear Association	6.681	1	.010		
N of Valid Cases	556				

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 87.25.
c SI vs. Non (0= non, 1=SI) = SI Attendee

TABLE 18. Chi-Square Tests: Gender by Survey Group (SI Non-participants Only)

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	27.343(b)	1	.000		
Continuity Correction(a)	26.828	1	.000		
Likelihood Ratio	27.548	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	27.328	1	.000		
N of Valid Cases	1714				

a Computed only for a 2x2 table
b 0 cells (.0%) have expected count less than 5. The minimum expected count is 305.82.

Another background characteristic that was analyzed was the students' major field. Because students in the sample were enrolled in over 100 different major fields, it was determined that academic college rather than major provided a better variable for analysis. There are ten academic colleges at the university and students from all ten colleges were represented in the sample. Crosstabulation on the four groups of students by academic college is shown in Table 19. Chi-square analysis was conducted to determine if the four groups differed from one another depending on the students' college of enrollment.

TABLE 19. Crosstabulation: College by SI Survey Groups

		SI Survey Groups				Total
		Survey & SI	Survey only	SI only	Neither	
AGRIC.	Count	42	165	52	251	510
	Expected Count	60.7	163.0	63.9	222.4	510.0
BUSINESS	Count	11	27	9	53	100
	Expected Count	11.9	32.0	12.5	43.6	100.0
EDUC.	Count	37	59	36	99	231
	Expected Count	27.5	73.8	28.9	100.7	231.0
ENGIN.	Count	14	72	17	70	173
	Expected Count	20.6	55.3	21.7	75.4	173.0
GEN. ST.	Count	46	95	50	128	319
	Expected Count	38.0	102.0	40.0	139.1	319.0
LIB. ARTS	Count	39	81	30	112	262
	Expected Count	31.2	83.7	32.8	114.2	262.0
SCIENCE	Count	37	99	42	131	309
	Expected Count	36.8	98.8	38.7	134.7	309.0
VET. MED.	Count	43	124	47	141	355
	Expected Count	42.3	113.5	44.5	154.8	355.0
Total	Count	269	722	283	985	2259
	Expected Count	269.0	722.0	283.0	985.0	2259.0

Because of the very small number of students enrolled in the College of Geosciences and the College of Architecture, these students were eliminated from the analysis. The results of this analysis are shown in Table 20. There was a statistically significant difference among the four groups based on academic college (p = .003). In order to explore whether these differences were related to

TABLE 20. Chi-Square Tests: College by Survey Groups

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.772(a)	21	.003
Likelihood Ratio	42.801	21	.003
N of Valid Cases	2259		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.91.

survey participation, additional Chi-square analysis was conducted comparing SI participants who completed the survey with SI participants who did not participate in the survey. The results seen in Table 21 indicated that these two groups did not have a statistically significant difference (p = .880). The same was true comparing SI non-participants who completed the survey with SI non-participants who did not submit a survey. These results can be seen in Table 22. The groups did not have a statistically significant difference (p = .117). These results indicated that any differences in college affiliation among the four groups was related to participation in SI rather than willingness to submit a survey. The differences in the groups related to SI participation will be explored later in this chapter.

TABLE 21. Chi-Square Tests: College by Survey Groups (SI Participants Only)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.050(a)	7	.880
Likelihood Ratio	3.054	7	.880
N of Valid Cases	552		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.75.

TABLE 22. Chi-Square Tests: College by Survey Groups (SI Non-participants Only)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.542(a)	7	.117
Likelihood Ratio	11.557	7	.116
N of Valid Cases	1707		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 33.84.

Grade level classification of students was also analyzed to determine whether the survey participants differed from those who did not submit a survey on this variable. Table 23 shows the crosstabulation of the four survey groups by grade level. Students classified as freshman status were those students who had completed fewer than 30 total semester hours. Sophomores have completed between 30 and 59 semester hours. Students who have completed between 60 and 89 hours were classified as Juniors. A student who has completed at least 90 semester hours is classified as a Senior. There were a very small number of students in the sample who had completed their degree program, but were taking additional post-baccalaureate courses. There were also a small number of students who were enrolled as non-degree seeking students. The students in these two groups were not included in this analysis.

TABLE 23. Crosstabulation: Classification by SI Survey Groups

		SI Survey Groups				Total
		Survey & SI	Survey only	SI only	Neither	
Fresh.	Count	118	270	151	391	930
	Expected Count	110.7	295.1	117.2	407.0	930.0
Soph.	Count	92	276	98	343	809
	Expected Count	96.3	256.7	101.9	354.1	809.0
Junior	Count	49	144	30	191	414
	Expected Count	49.3	131.4	52.2	181.2	414.0
Senior	Count	14	38	10	79	141
	Expected Count	16.8	44.7	17.8	61.7	141.0
Total	Count	273	728	289	1004	2294
	Expected Count	273.0	728.0	289.0	1004.0	2294.0

Chi-square tests were conducted to test for pattern differences among the survey groups differed based on their grade level classification. Table 24 shows the results of the Chi-Square tests for all four groups. There were significant pattern differences ($p < .001$) among the groups. Additional Chi-square tests were run to determine if these differences were related to the students' willingness to submit a survey. The first analysis shown in Table 25 compares SI participants who submitted a survey with SI participants who did not submit a survey. There were statistically significant pattern differences between the groups at the .05 level ($p = .029$) although it should be noted that this would not be considered statistically significant at the .01 level. Chi-square tests comparing the two groups of students who did not participate in SI are shown in Table 26. There were no significant pattern differences between these two groups of students ($p = .088$). Taken together, these results indicated that any

pattern differences in grade level among the four groups was related to participation in SI rather than willingness to submit a survey. These differences will be explored later in this chapter.

TABLE 24. Chi-Square Tests: Classification by Survey Groups

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.032(a)	9	.000
Likelihood Ratio	37.241	9	.000
N of Valid Cases	2294		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.78.

TABLE 25. Chi-Square Tests: Classification by Survey Groups (SI Participants Only)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.026(a)	3	.029
Likelihood Ratio	9.077	3	.028
N of Valid Cases	562		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.66.

TABLE 26. Chi-Square Tests: Classification by Survey Groups (SI Non-participants Only)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.548(a)	3	.088
Likelihood Ratio	6.665	3	.083
N of Valid Cases	1732		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 49.18.

An additional background variable that was considered was the students' cumulative college grade point ratio prior to the semester of the study. Grade point ratio is based on a typical four point grading scale. The sample included

approximately 40% freshmen level students, many of whom only had one semester of graded work. Table 27 contains the descriptive data for cumulative GPR by SI survey groups. It should be noted that of the sample of 2,297 students, only 2,261 students had a valid GPR. The remaining 38 students were first semester freshmen or transfer students during the semester data was collected.

TABLE 27. Descriptive Statistics:
SI Survey Groups Cumulative GPR as of Fall 2003

SI Survey Groups	N	Minimum	Maximum	Mean	Std. Deviation
Survey & SI	269	.90	4.00	2.8499	.62948
Survey only	719	.67	4.00	2.9317	.67282
SI only	286	.56	4.00	2.8462	.66997
Neither	987	.44	4.00	2.7665	.67773
Total	2261	.44	4.00	2.8390	.67295

TABLE 28. ANOVA for Cumulative GPR

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.425	3	3.808	8.493	.000
Within Groups	1012.031	2257	.448		
Total	1023.456	2260			

One-way analysis of variance (ANOVA) was conducted to determine if there were significant differences among the survey groups. Table 28 shows the results of the ANOVA by SI survey groups with cumulative GPR as the dependent variable. These results indicated that there were some statistically

significant differences (p< .001) in mean GPR among the groups. Post hoc analysis was conducted to find the source of these differences.

TABLE 29. Multiple Comparisons: Cumulative GPR
Tukey HSD

(I) SI Survey Groups	(J) SI Survey Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Survey & SI	Survey only	-.0818	.04786	.319	-.2049	.0412
	SI only	.0037	.05687	.998	-.1425	.1499
	Neither	.0834	.04606	.268	-.0350	.2019
Survey only	Survey & SI	.0818	.04786	.319	-.0412	.2049
	SI only	.0856	.04681	.261	-.0348	.2059
	Neither	.1653(*)	.03283	.000	.0809	.2497
SI only	Survey & SI	-.0037	.05687	1.000	-.1499	.1425
	Survey only	-.0856	.04681	.261	-.2059	.0348
	Neither	.0797	.04497	.287	-.0359	.1953
Neither	Survey & SI	-.0834	.04606	.268	-.2019	.0350
	Survey only	-.1653(*)	.03283	.000	-.2497	-.0809
	SI only	-.0797	.04497	.287	-.1953	.0359

* The mean difference is significant at the .05 level.

Table 29 shows the results of the post hoc analysis. There was only one pairwise statistically significant difference between the groups. SI participants who completed the survey were not significantly different from SI participants who did not complete the survey (p = .998). However, SI non-participants who completed the survey were statistically different from non-participants who did not complete the survey (p < .001). The mean difference between the two groups was .165 grade points. This difference was rather small compared to the overall standard deviation for the sample (SD = .673). It is reasonable, then, to

conclude that there were no differences in the four survey groups with respect to the mean cumulative grade point ratios of the students prior to the semester of the research study.

The preliminary analysis of the background data indicated that the students who completed the on-line survey were not significantly different from students who did not complete the survey with respect to SAT math and verbal scores, cumulative grade point average, ethnicity, grade level classification, or college of enrollment. Based on these findings, the results of the on-line survey can be generalized to the entire sample. There were some differences between survey participants and non-participants related to gender which will be discussed in subsequent analysis and interpretation of the results.

Preliminary Analysis Based on Course Subject

The second step in the preliminary data analysis was designed to look at SI attendance patterns based on the two types of courses. The courses selected for the study were grouped into two broad categories of science-based and non science-based courses. If the attendance and engagement patterns had been found to be similar in both types of courses, then it was reasonable to assume that engagement in SI was not determined by course type and the results of the study could be aggregated for further analysis. If, however, significant pattern differences had been found between science and non-science courses, then the data would have needed to be analyzed separately based on course type. The SI courses categorized as science courses were the two

Biology courses, the two Chemistry courses, and Horticulture. The remaining three courses in History and Political Science were categorized as non-science courses.

A one-way ANOVA was conducted using subject types (science or non-science) as the grouping variable and total engagement in SI as the dependent variable. The results of the ANOVA are presented in Table 30. The results indicated that there was not a statistically significant difference in engagement (p =.815) related to whether students were enrolled in a science-based or non-science based course.

TABLE 30. ANOVA Engagement by Subject Type

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.865	1	7.865	.054	.815
Within Groups	331363.858	2295	144.385		
Total	331371.722	2296			

Based on the preliminary data, it was established that SI attendance patterns were consistent for science versus non-science courses. All subsequent analysis considered the data in aggregate and interpretation of the data was based on the assumption that the results would remain consistent for both types of courses.

Summary of Preliminary Data Analysis

There were three important findings from the preliminary data analysis which guided the primary data analysis. First, the results of the on-line survey

can be generalized to the entire sample. There were no differences between survey participants and non participants based on their SAT scores, cumulative grade point averages, ethnicity, college, or classification. There were some slight differences based on gender which will be taken into consideration in the interpretation of the results of the survey. The second finding from the preliminary data analysis was that there were no significant differences in SI attendance patterns between science and non-science SI courses. Based on this finding, the data was aggregated for all subsequent analysis. Finally, there were significant differences found between SI participants and non-participants on all of the variables considered in the preliminary analysis. These differences and exploration of differences on other variables of interest were the focus of the primary data analysis.

The results of the primary data analysis are explicated in the remainder of this chapter. The purpose of this study was to determine how cognitive, demographic, and motivational factors could be used to predict help-seeking behavior in college students. An additional purpose of the study was to determine the efficacy of SI. This section is organized based on the four original research questions developed to address these concerns. Discussion of these results and implications for professional practice are detailed in Chapter Five.

FINDINGS FOR RESEARCH QUESTION ONE

Research Question One: What is the relationship of the demographic variables with engagement in SI?

There are a number of demographic variables which have been labeled by higher education administrators as risk factors. Researchers have most commonly identified socio-economic status (SES), ethnicity, gender, and parent education as the variables associated with high risk for failure (Boyd, 2004; Friedlander, 1980; Hodges & White, 2001; Stansbury, 2001). This research question was designed to better understand how these demographic factors may or may not be related to students' willingness to seek out academic assistance in the form of SI sessions. The first step in answering research question one was to detail the descriptive data for these four variables of interest: ethnicity, gender, SES, and parent education. For the first two variables, information was available for the entire sample. It has already been established based on the preliminary data analysis that there were statistically significant differences between SI participants and non participants based on gender and ethnicity. More extensive analysis of these differences is reported later in this section. Information on SES and parent education was only available for the students who completed the on-line survey. In addition, student grade level classification and college of enrollment were identified as variables of interest based on the preliminary data analysis.

For each of the demographic variables, two separate sets of analyses were conducted. First, univariate General Linear Model (GLM) analysis was run using SI engagement as the dependent variable. Univariate GLM is synonymous with ANOVA. SI engagement was computed as a multiplicative variable which combined total number of SI sessions attended with the mean participation score. This variable took into account both attendance and level of participation.

The second analysis run for each of the demographic variables considered SI engagement based on the levels of engagement which were detailed in Chapter Three. Each student was grouped according to his or her level of SI engagement. Those who did not attend any SI sessions were labeled as non-SI. The students who did attend SI were labeled as either high engagement or low engagement based on the number of sessions they attended and how actively they participated in these sessions. Students labeled as high engagement attended at least six sessions and had a mean participation score of at least 2.5 on the 4.0 scale. For each demographic variable, crosstabulations were run and chi-square analysis was conducted to detect pattern differences among the three engagement groups.

Ethnicity

Table 31 shows the breakdown of the sample by ethnicity. The sample very closely represented the general population of students enrolled at the university. According to institutional data for Spring 2004 (Office of Institutional

Studies and Planning, 2004), 82.2% of undergraduate students were identified as White, 9.5% were Hispanic, 2.3% were African American, 3.2% were Asian or Pacific Islander, and the remaining 2.9% were identified as international students, Native American, or "other".

TABLE 31. Ethnicity Frequencies for Sample Compared to University

	Study Sample		University Totals	
	Frequency	Percent	Frequency	Percent
African American	56	2.4	768	2.3
Hispanic	222	9.7	3154	9.5
Native American	19	.8	172	.5
Asian or Pacific Islander	98	4.3	1059	3.2
White	1894	82.5	27418	82.2
International	0	0	525	1.6
Other	8	.3	265	.8
Total	2297	100.0	33361	100.0

Because the number of students identified as "Native American" and "Other" in the sample was so small, these students were eliminated from the subsequent analysis of ethnicity. There were no international students in the sample. Using engagement in SI as the dependent variable and ethnicity as the grouping variable, Table 32 shows the Univariate GLM results. Ethnicity does have a statistically significant (p =.010) relationship with engagement in SI. The effect size for this analysis was very small (R^2 and eta squared = .005). Post hoc analysis was conducted to find the source of the differences among the ethnic groups. To control for Type I error, Tukey's Honestly Significant Difference (HSD) correction was used in the pairwise comparisons.

TABLE 32. Tests of Between-Subjects Effects (Ethnicity)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1613.525(a)	3	537.842	3.798	.010	.005
Intercept	8307.230	1	8307.230	58.655	.000	.025
ETHNICITY	1613.525	3	537.842	3.798	.010	.005
Error	320933.189	2266	141.630			
Total	355432.000	2270				
Corrected Total	322546.714	2269				

a R Squared = .005 (Adjusted R Squared = .004)

Table 33 shows the mean engagement scores by ethnic group. The estimated grand mean engagement score for all students was 4.145. Hispanic students had much higher mean engagement scores than all of the other groups. The group with the lowest mean engagement score was African American students. The largest estimated difference was between Hispanic and African American students. The confidence intervals, however, may provide a better perspective on the relationship between race and SI engagement. Because there were far more White students in the sample, we can have more confidence that the true population mean is relatively close to the estimated mean for this group of students. The very small number of African American students in the sample resulted in a lower bound for the confidence interval which was a negative number (-.065). This “impossible” result highlights the fact that some of these statistics must be interpreted with caution. Based on the post hoc results in Table 34, the only statistically significant difference in mean engagement scores was between White and Hispanic students (p = .005).

TABLE 33. Estimated Marginal Means (Ethnicity)

			95% Confidence Interval	
ETHNICITY	Mean	Std. Error	Lower Bound	Upper Bound
African Amer.	3.054	1.590	-.065	6.172
Hispanic	6.356	.799	4.790	7.922
Asian	3.633	1.202	1.275	5.990
White	3.539	.273	3.002	4.075
Overall	4.145	.541	3.084	5.207

TABLE 34. Multiple Comparisons: Engagement by Ethnicity
Tukey HSD

					95% Confidence Interval	
(I) ETHNICITY	(J) ETHNICITY	Mean Diff. (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
African Amer.	African Amer.					
	Hispanic	-3.30228	1.779628	.248	-7.87760	1.27303
	Asian	-.57908	1.993566	.991	-5.70442	4.54626
	White	-.48497	1.613655	.991	-4.63358	3.66364
Hispanic	African Amer.	3.30228	1.779628	.248	-1.27303	7.87760
	Hispanic					
	Asian	2.72320	1.443321	.234	-.98749	6.43389
	White	2.81731(*)	.844245	.005	.64681	4.98782
Asian	African Amer.	.57908	1.993566	.991	-4.54626	5.70442
	Hispanic	-2.72320	1.443321	.234	-6.43389	.98749
	Asian					
	White	.09411	1.232875	1.000	-3.07554	3.26376
White	African Amer.	.48497	1.613655	.991	-3.66364	4.63358
	Hispanic	-2.81731(*)	.844245	.005	-4.98782	-.64681
	Asian	-.09411	1.232875	1.000	-3.26376	3.07554
	White					

Based on observed means.
* The mean difference is significant at the .05 level.

The second analysis looked at the students' level of SI engagement. Table 35 shows the crosstabulation of ethnicity by SI engagement groups. Hispanic and Asian students were overrepresented in both the low and high engagement groups, while White students were underrepresented in both. There was very little difference in the expected and actual count in all three engagement groups for African American students. The chi-square analysis indicated that there were statistically significant (p=.007) differences in attendance patterns based on ethnicity, x^2 = 17.669 (df = 6; n = 2270) (Table 36).

TABLE 35. Crosstabulation: Ethnicity by Level of Engagement

		Level of Engagement			Total
		Non SI	Low	High	
African Amer.	Count	40	11	5	56
	Expected Count	42.3	8.6	5.1	56.0
Hispanic	Count	149	41	32	222
	Expected Count	167.6	34.1	20.2	222.0
Asian	Count	66	22	10	98
	Expected Count	74.0	15.1	8.9	98.0
White	Count	1459	275	160	1894
	Expected Count	1430.1	291.2	172.7	1894.0
Total	Count	1714	349	207	2270
	Expected Count	1714.0	349.0	207.0	2270.0

TABLE 36. Chi-Square Tests: Ethnicity by Level of Engagement

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.669(a)	6	.007
Continuity Correction			
Likelihood Ratio	16.244	6	.013
Linear-by-Linear Association			
N of Valid Cases	2270		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.11.

Gender

As discussed in Chapter Two, there is a significant body of literature suggesting that there are gender differences with respect to help-seeking (Addis & Mahalik, 2003; Alexitch, 1997; Gloria, Hird, & Navarro, 2001; Nadler, 1991). The gender breakdown for the study sample is shown in Table 37. Female students are overrepresented in this sample compared to the overall university averages. The gender breakdown among all undergraduate students for spring 2004 was 50.8% male and 49.2% female (Office of Institutional Studies and Planning, 2004).

TABLE 37. Descriptive Statistics: Gender

	Study Sample	Percent	University	Percent
Female	1382	60.2	16419	49.2
Male	915	39.8	16942	50.8
Total	2297	100.0	33361	100.0

Using engagement as the dependent variable, Table 38 shows that for this study there were no significant differences (p = .344) between male and female students with respect to their level of engagement in SI. Table 39 shows the mean engagement scores of students by gender. Females had slightly higher levels of engagement than their male counterparts.

TABLE 38. Tests of Between-Subjects Effects (Gender)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	129.506(a)	1	129.506	.897	.344
Intercept	31631.391	1	31631.391	219.157	.000
GENDER	129.506	1	129.506	.897	.344
Error	331242.217	2295	144.332		
Total	365231.000	2297			
Corrected Total	331371.722	2296			

a R Squared = .000 (Adjusted R Squared = .000)

TABLE 39. Estimated Marginal Means (Gender)

GENDER	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Female	4.033	.323	3.399	4.666
Male	3.548	.397	2.769	4.326

In order to further explore possible gender differences, crosstabulation and chi-square analysis were conducted to detect pattern differences between the genders based on level of SI engagement. Table 40 shows the crosstabulation of SI engagement groups by gender. Female students were overrepresented in both the high and low SI engagement groups. This analysis

is more sensitive to group differences and unlike the previous analysis, the chi-square analysis did indicate that there was a statistically significant ($p < .001$) difference in attendance patterns based on gender, $x^2 = 15.866$ (df = 2; n = 2297) (Table 41).

TABLE 40. Crosstabulation: Gender by Level of Engagement

		Level of Engagement			Total
		Non SI	Low Engagement	High Engagement	
Female	Count	1004	234	144	1382
	Expected Count	1043.9	211.8	126.3	1382.0
Male	Count	731	118	66	915
	Expected Count	691.1	140.2	83.7	915.0
Total	Count	1735	352	210	2297
	Expected Count	1735.0	352.0	210.0	2297.0

TABLE 41. Chi-Square Tests of GENDER by Level of Engagement

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.866(a)	2	.000
Likelihood Ratio	16.153	2	.000
Linear-by-Linear Association	14.799	1	.000
N of Valid Cases	2297		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 83.65.

Because the GLM analysis and the chi-square tests had conflicting results, it was deemed necessary to explore what might account for these differences. One reasonable possibility was that males were less likely to attend SI, but if they chose to attend they participated more actively in the sessions.

Table 42 shows the mean participation ratings by gender for SI attendees. Males did have slightly higher mean participation scores than female students, but as illustrated in Table 43, the mean differences in participation were not statistically significant (p = .191).

TABLE 42. Mean Participation Scores by Gender

GENDER		N	Minimum	Maximum	Mean	Std. Deviation
Female	Participation	378	1.000	4.000	2.37816	.537159
Male	Participation	184	1.667	4.000	2.44345	.590228

TABLE 43. Tests of Between-Subjects Effects (Gender)
Dependent Variable: Participation

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.528(a)	1	.528	1.712	.191
Intercept	2877.117	1	2877.117	9338.538	.000
GENDER	.528	1	.528	1.712	.191
Error	172.531	560	.308		
Total	3408.926	562			
Corrected Total	173.058	561			

a R Squared = .003 (Adjusted R Squared = .001)

Socioeconomic Status (SES)

For this study, students self-reported their family household income as part of the on-line survey. Table 44 shows the frequencies for the respondents in each SES category. There was no family income data available for students who did not fill out the on-line survey. It should be noted that the student population at Texas A&M University tends to come from much more affluent backgrounds than the general population. Students who reported their household income falling between $80,000 and $150,000 were the largest group in the sample and students from families with less than $50,000 of annual household income comprised less than ten percent of the sample.

TABLE 44. Frequencies by SES Group

		Frequency	Percent
	Less than $20,000	27	1.2
	$20,000 to $34,999	70	3.0
	$35,000 to $49,999	119	5.2
	$50,000 to $79,999	238	10.4
	$80,000 to $150,000	323	14.1
	More than $150,000	163	7.1
	Total	940	40.9
	Missing data	1357	59.1
Total		2297	100.0

In order to explore whether there was a relationship between engagement in SI and SES, analysis was run using SI engagement as the dependent variable and SES groups as the fixed factor. There were no

significant differences (F = .568, df = 5; *p* = .725) among the SES groups with regard to engagement in SI (Table 45). Table 46 shows the estimated mean engagement scores by SES group. The group with the highest mean engagement score was those students who identified themselves as falling within the lowest income group, but there was not a consistent pattern of engagement based on SES. The means plot for this data shown in Figure 1 illustrates the lack of consistent pattern of engagement by SES category.

TABLE 45. Tests of Between-Subjects Effects (SES)
Dependent Variable: Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	594.586(a)	5	118.917	.568	.725
Intercept	14293.863	1	14293.863	68.227	.000
SES	594.586	5	118.917	.568	.725
Error	195678.014	934	209.505		
Total	220722.000	940			
Corrected Total	196272.600	939			

a R Squared = .003 (Adjusted R Squared = -.002)

TABLE 46. Estimated Marginal Means (SES)
Dependent Variable: Engagement

			95% Confidence Interval	
SES	Mean	Std. Error	Lower Bound	Upper Bound
Less than $20,000	7.704	2.786	2.237	13.170
$20,000 to $34,999	5.800	1.730	2.405	9.195
$35,000 to $49,999	3.815	1.327	1.211	6.419
$50,000 to $79,999	5.210	.938	3.369	7.051
$80,000 to $150,000	5.545	.805	3.964	7.125
More than $150,000	4.264	1.134	2.039	6.489

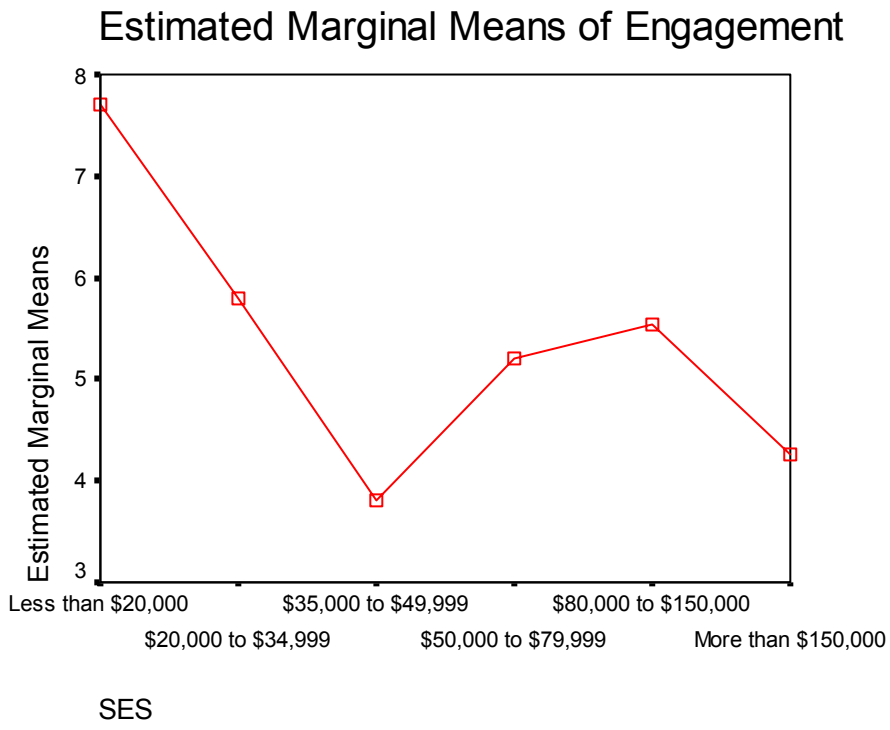

Figure 1. Means Plot for Engagement by SES Category.

Looking at SES using SI engagement as a categorical variable yielded a similar result. Crosstabulations and chi-square analysis of SI engagement groups by SES groups are shown in Tables 47 and 48. It should be noted that there were two cells in the contingency table with expected values less than five. However, these two cells only accounted for 11.1% of the total cells in the table. Hinkle, Weirsma, and Jurs (1998) recommend a correction only if more than 20% of the cells have expected values of less than five. There were no significant differences (x^2 = 11.704; df = 10; n = 940; p = .305) in SI engagement patterns based on students' reported household income. Using family income

as the proxy for SES, it does not appear that there were any significant relationships between SES and SI engagement.

TABLE 47. Crosstabulation: SES by Level of Engagement

		Level of Engagement			Total
		Non SI	Low	High	
Less than $20,000	Count	14	6	7	27
	Expected Count	19.8	3.8	3.3	27.0
$20,000 to $34,999	Count	55	7	8	70
	Expected Count	51.5	10.0	8.6	70.0
$35,000 to $49,999	Count	88	20	11	119
	Expected Count	87.5	17.0	14.6	119.0
$50,000 to $79,999	Count	174	35	29	238
	Expected Count	175.0	33.9	29.1	238.0
$80,000 to $150,000	Count	238	41	44	323
	Expected Count	237.4	46.0	39.5	323.0
More than $150,000	Count	122	25	16	163
	Expected Count	119.8	23.2	19.9	163.0
Total	Count	691	134	115	940
	Expected Count	691.0	134.0	115.0	940.0

TABLE 48. Chi-Square Tests for SES by SI Engagement

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.704(a)	10	.305
Likelihood Ratio	10.918	10	.364
Linear-by-Linear Association	.831	1	.362
N of Valid Cases	940		

a 2 cells (11.1%) have expected count less than 5. The minimum expected count is 3.30.

Parent Education

The fourth demographic factor variable analyzed was parent education. As with SES, this variable was self-reported and was only available for those students who submitted an on-line survey. Some very interesting patterns emerge when looking at the relationship between SI engagement and parent education. Table 49 shows frequencies for students in the sample based on parent education. Almost 60% of the students indicated that their fathers had graduated from college and about the same percentage of students reported mothers with at least a Bachelor's degree.

TABLE 49. Frequencies for Parent Education

	Father	Percent	Cum. Percent	Mother	Percent	Cum. Percent
Did not finish HS	24	2.4	2.4	20	2.0	2.0
HS Grad or GED	139	14.1	16.6	127	12.8	14.8
Some college	248	25.2	41.8	284	28.6	43.4
Bachelor's Degree	327	33.2	75.0	377	38.0	81.5
Master's Degree	146	14.8	89.8	147	14.8	96.3
PhD or Prof. Degree	100	10.2	100.0	37	3.7	100.0
Total	984	100.0	2.4	992	100.0	

The results shown in Table 50 indicated that there were statistically significant differences (p = .049) in SI engagement based on the level of parent education. It should be noted, however, that the effect size for this model is quite low (R^2 = .047) indicating that only about 5% of the total variance in SI engagement can be accounted for by parent education level. However, it is

interesting to note that while there is not a significant main effect based on either mother's level of education (p =.323; eta^2 =.006) or father's education (p =.173; eta^2 =.008) there was a statistically significant effect (p = .017; eta^2 =.039) based on the interaction between mother's and father's level of education.

TABLE 50. Tests of Between-Subjects Effects (Parent Education)
Dependent Variable: Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	9890.736(a)	32	309.085	1.460	.049	.047
Intercept	7339.490	1	7339.490	34.661	.000	.035
FATHER EDUC.	1634.921	5	326.984	1.544	.173	.008
MOTHER EDUC.	1237.517	5	247.503	1.169	.323	.006
FATHER ED. by MOTHER ED.	8163.491	22	371.068	1.752	.017	.039
Error	200528.105	947	211.751			
Total	236380.000	980				
Corrected Total	210418.841	979				

a R Squared = .047 (Adjusted R Squared = .015)

Table 51 shows the mean engagement scores by level of mother's education. The highest levels of SI engagement were among students whose mothers did not finish high school or had advanced degrees. At first glance it appears that mothers may have some influence on these students willingness to seek out academic assistance and actively engage in learning through SI. However, a closer look at the confidence intervals indicated that this result may be more of a function of sample size than a real difference in the population means.

TABLE 51. Estimated Marginal Means (Mother Education)
Dependent Variable: Engagement

MotherEducation	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Did not finish HS	14.527(a)	4.767	5.171	23.883
HS Grad or GED	3.281	2.324	-1.279	7.842
Some college	5.826	1.371	3.135	8.517
Bachelor's Degree	4.592	2.543	-.398	9.582
Master's Degree	7.095	2.710	1.776	12.414
PhD or Prof. Degree	9.488(a)	3.451	2.715	16.260

a Based on modified population marginal mean.

As was the case with the other demographic variables, additional analysis was conducted with SI engagement as a categorical variable. Table 52 shows the crosstabulation for SI attendance by mother's level of education. Chi-square analysis of the crosstabulation indicated that there were no significant differences (p = .075) among the groups with regard to SI engagement (Table 53).

TABLE 52. Crosstabulation: SI Engagement by Mother's Level of Education

		Level of Engagement			Total
		Non SI	Low	High	
Did not finish HS	Count	14	3	3	20
	Expected Count	14.6	3.0	2.4	20.0
HS Grad or GED	Count	91	22	14	127
	Expected Count	92.8	18.9	15.2	127.0
Some college	Count	208	48	28	284
	Expected Count	207.6	42.4	34.1	284.0
Bachelor's Degree	Count	280	58	39	377
	Expected Count	275.5	56.2	45.2	377.0
Master's Degree	Count	105	12	30	147
	Expected Count	107.4	21.9	17.6	147.0
PhD or Prof. Degree	Count	27	5	5	37
	Expected Count	27.0	5.5	4.4	37.0
Total	Count	725	148	119	992
	Expected Count	725.0	148.0	119.0	992.0

TABLE 53. Chi-Square Tests:
SI Engagement by Mother's Level of Education

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.962(a)	10	.075
Likelihood Ratio	16.381	10	.089
Linear-by-Linear Association	.583	1	.445
N of Valid Cases	992		

a 3 cells (16.7%) have expected count less than 5. The minimum expected count is 2.40.

Similar results were obtained for father's level of education. Crosstabulations are displayed in Table 54. As can be seen in this table, observed counts and expected counts were very close among the groups based on their level of SI engagement. Chi-square analysis (Table 55) confirmed this result showing no significant pattern differences among the groups (p = .643).

TABLE 54. Crosstabulation: SI Engagement by Father Education

		Level of Engagement			Total
		Non SI	Low	High	
Did not finish HS	Count	18	4	2	24
	Expected Count	17.5	3.6	2.9	24.0
HS Grad or GED	Count	109	15	15	139
	Expected Count	101.4	20.6	17.0	139.0
Some college	Count	172	45	31	248
	Expected Count	181.0	36.8	30.2	248.0
Bachelor's Degree	Count	242	49	36	327
	Expected Count	238.6	48.5	39.9	327.0
Master's Degree	Count	107	20	19	146
	Expected Count	106.5	21.7	17.8	146.0
PhD or Prof. Degree	Count	70	13	17	100
	Expected Count	73.0	14.8	12.2	100.0
Total	Count	718	146	120	984
	Expected Count	718.0	146.0	120.0	984.0

TABLE 55. Chi-Square Tests for SI Engagement by Father's Level of Education

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.858(a)	10	.643
Likelihood Ratio	7.753	10	.653
Linear-by-Linear Association	1.229	1	.268
N of Valid Cases	984		

a 2 cells (11.1%) have expected count less than 5. The minimum expected count is 2.93.

Classification

The next variable of interest, student classification, was identified based on the preliminary analysis. Table 56 shows frequencies in the sample based on classification. Because of the small number of students identified as "non degree-seeking" and "Post-grad" in the sample, these students were eliminated from the subsequent analysis of classification.

TABLE 56. Frequencies: Grade Level Classification

	Frequency	Percent
Non-degree seeking	1	.0
Freshmen	930	40.5
Sophomore	809	35.2
Junior	414	18.0
Senior	141	6.1
Post-grad	2	.1
Total	2297	100.0

Using engagement in SI as the dependent variable and classification as the grouping variable, Table 57 shows the Univariate GLM results. Classification does have a statistically significant (p =.002) relationship with engagement in SI. The effect size for this analysis was very small (R^2 and eta squared = .006). Post hoc analysis was conducted to identify the source of the group differences. To control for Type I error, Tukey's Honestly Significant Difference (HSD) correction was used in the pairwise comparisons. These results are shown in Table 58. The only statistically significant differences in mean engagement scores (p = .003) were between freshmen and seniors. There were no significant differences between any of the other groups.

TABLE 57. Tests of Between-Subjects Effects (Classification)
Dependent Variable: Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2132.462(a)	3	710.821	4.945	.002	.006
Intercept	13263.501	1	13263.501	92.266	.000	.039
CLASSIFICATION	2132.462	3	710.821	4.945	.002	.006
Error	329194.981	2290	143.753			
Total	365231.000	2294				
Corrected Total	331327.442	2293				

a R Squared = .006 (Adjusted R Squared = .005)

TABLE 58. Multiple Comparisons (Classification)
Dependent Variable: Engagement Tukey HSD

(I) CLASS	(J)CLASS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Fresh.	So.	1.05101	.576425	.263	-.43093	2.53295
	Jr.	1.58599	.708381	.113	-.23520	3.40718
	Sr.	3.77589(*)	1.083559	.003	.99014	6.56163
Soph.	Fr.	-1.05101	.576425	.263	-2.53295	.43093
	Jr.	.53498	.724515	.882	-1.32769	2.39765
	Sr.	2.72488	1.094175	.062	-.08816	5.53791
Junior	Fr.	-1.58599	.708381	.113	-3.40718	.23520
	So.	-.53498	.724515	.882	-2.39765	1.32769
	Sr.	2.18990	1.169084	.240	-.81572	5.19552
Senior	Fr.	-3.77589(*)	1.083559	.003	-6.56163	-.99014
	So.	-2.72488	1.094175	.062	-5.53791	.08816
	Jr.	-2.18990	1.169084	.240	-5.19552	.81572

Based on observed means.
* The mean difference is significant at the .05 level.

Table 59 shows the estimated mean engagement scores by classification. The estimated grand mean engagement score for all students was 3.130. The pattern of these scores is graphically illustrated in Figure 2. The higher the

grade level, the less likely students were to be actively involved in SI. One possible interpretation of this finding is that as students matriculate toward graduation, they become more self sufficient. However, it should be noted that the targeted classes were exclusively lower level courses. Juniors and seniors who were enrolled in these classes may not be representative of the general population of upper level students in the university.

TABLE 59. Estimated Marginal Means (Classification)
Dependent Variable: Engagement

			95% Confidence Interval	
CLASSIFICATION	Mean	Std. Error	Lower Bound	Upper Bound
Freshmen	4.733	.393	3.962	5.504
Sophomore	3.682	.422	2.856	4.509
Junior	3.147	.589	1.992	4.303
Senior	.957	1.010	-1.023	2.938
Overall	3.130	.326	2.491	3.769

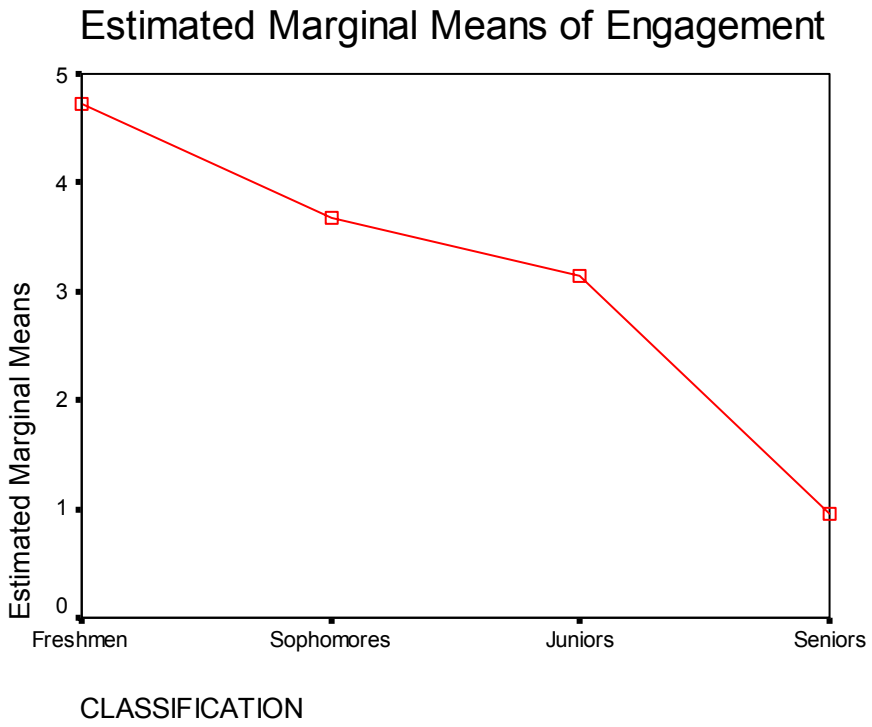

Figure 2. Means Plot for Engagement by Grade Level Classification.

Looking at SI engagement as a categorical variable yielded similar results. Table 60 shows the crosstabulation of grade level classification by SI engagement groups. Freshmen were overrepresented in both the low and high engagement groups while the rest of the students were overrepresented in the non-SI group. The chi-square analysis indicated that there were statistically significant ($p < .001$) differences in attendance patterns based on ethnicity, $x^2 = 28.441$ (df = 6; $n = 2294$) (Table 61).

TABLE 60. Crosstabulation:
Classification by Level of Engagement

		Level of Engagement			Total
		Non SI	Low Engagement	High Engagement	
Freshmen	Count	661	164	105	930
	Expected Count	702.2	142.7	85.1	930.0
Sophomores	Count	619	121	69	809
	Expected Count	610.8	124.1	74.1	809.0
Juniors	Count	335	45	34	414
	Expected Count	312.6	63.5	37.9	414.0
Seniors	Count	117	22	2	141
	Expected Count	106.5	21.6	12.9	141.0
Total	Count	1732	352	210	2294
	Expected Count	1732.0	352.0	210.0	2294.0

TABLE 61. Chi-Square Tests: Classification by Level of Engagement

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.441(a)	6	.000
Likelihood Ratio	33.730	6	.000
N of Valid Cases	2294		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.91.

Major Field of Study

The final variable of interest for research question one was major field of study. Because the students in the study were enrolled in over 100 different majors, college affiliation was used as a proxy for major field of study. The preliminary data analysis revealed some significant differences among the students based on their college affiliation. As in the preliminary analysis,

students enrolled in architecture and geosciences were eliminated from this analysis because of the small number of students in the sample from these two colleges. Using engagement as the dependent variable and college as the grouping variable, univariate GLM analysis was conducted. The results of the analysis are shown in Table 62. There were not any statistically significant differences among the groups. Estimated marginal means for each college are shown in Table 63. Agriculture and engineering students had the lowest levels of engagement, while the students with the highest engagement were enrolled in the College of Education and Human Development.

TABLE 62. Tests of Between-Subjects Effects (College)
Dependent Variable: Engagement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1818.072(a)	7	259.725	1.784	.086	.006
Intercept	29714.196	1	29714.196	204.132	.000	.083
COLLEGE	1818.072	7	259.725	1.784	.086	.006
Error	327664.087	2251	145.564			
Total	363266.000	2259				
Corrected Total	329482.159	2258				

a R Squared = .006 (Adjusted R Squared = .002)

TABLE 63. Estimated Marginal Means (College)
Dependent Variable: Engagement

			95% Confidence Interval	
COLLEGE	Mean	Std. Error	Lower Bound	Upper Bound
AGRICULTURE	2.418	.534	1.370	3.465
BUSINESS	4.360	1.206	1.994	6.726
EDUCATION	4.922	.794	3.365	6.479
ENGINEERING	3.335	.917	1.536	5.134
GEN. STUDIES	4.690	.676	3.365	6.014
LIBERAL ARTS	4.187	.745	2.725	5.649
SCIENCE	4.608	.686	3.262	5.954
VET. MEDICINE	3.763	.640	2.508	5.019

In order to further explore possible differences based on college affiliation, pattern differences were considered among the colleges based on level of SI engagement. Table 64 shows the crosstabulation of SI engagement groups by college. This analysis was more sensitive to group differences and unlike the previous analysis, the chi-square analysis did indicate that there were statistically significant ($p < .001$) differences in attendance patterns based on college affiliation, $x^2 = 33.719$ (df = 14; $n = 2259$) (Table 65). Students enrolled in the colleges of Education, Liberal Arts, and General Academics were overrepresented in both the low and high engagement groups. Engineering and Agriculture students were more likely to be in the non-SI group.

TABLE 64. Crosstabulation: College by Level of Engagement

		Level of Engagement			Total
		Non SI	Low	High	
AGRI.	Count	416	64	30	510
	Expected Count	385.4	77.7	47.0	510.0
BUS.	Count	80	13	7	100
	Expected Count	75.6	15.2	9.2	100.0
EDUC.	Count	158	41	32	231
	Expected Count	174.6	35.2	21.3	231.0
ENGIN.	Count	142	20	11	173
	Expected Count	130.7	26.3	15.9	173.0
GEN.ST.	Count	223	64	32	319
	Expected Count	241.1	48.6	29.4	319.0
LIB. ARTS	Count	193	42	27	262
	Expected Count	198.0	39.9	24.1	262.0
SCIENCE	Count	230	43	36	309
	Expected Count	233.5	47.1	28.5	309.0
VET. MED.	Count	265	57	33	355
	Expected Count	268.3	54.1	32.7	355.0
Total	Count	1707	344	208	2259
	Expected Count	1707.0	344.0	208.0	2259.0

TABLE 65. Chi-Square Tests
College by Level of Engagement

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	33.719(a)	14	.002
Likelihood Ratio	33.768	14	.002
N of Valid Cases	2259		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.21.

Summary of Findings for Research Question One

Research question one asked "What is the relationship of the demographic variables with engagement in SI?" In order to answer this question, six separate demographic variables were analyzed: ethnicity, gender, SES, parent education, grade level, and college of enrollment. For each variable, analysis was conducted to look at engagement in SI as a continuous variable using univariate General Linear Model (GLM) and as a categorical variable using crosstabulations and chi-square analysis.

The results of the GLM analysis showed that there were some small, but statistically significant differences in SI engagement based on the students' ethnicity. Post hoc analysis indicated that Hispanic students had significantly higher levels of engagement than White students, but that there were no other statistically significant differences between the ethnic groups. The ethnic group with the lowest level of engagement in SI was African American students, but their group mean was less than one point lower than the mean for all students in the sample. Crosstabulation of SI attendance and ethnicity also indicated significant pattern differences among the groups. Hispanic and Asian students were overrepresented in both the low and high engagement groups, while White students were overrepresented in the non-SI group. African American students' pattern of engagement was very close to the expected counts.

Gender was the second demographic variable analyzed. The GLM analysis using SI engagement as the dependent variable showed no significant

differences between male and female students. However, chi-square tests for pattern differences based on the crosstabulation of SI attendance and gender did indicate a statistically significant difference in the two groups. Female students were more likely to attend SI and had higher overall mean engagement scores than male students. Subsequent analysis indicated that male students who participated in SI had slightly higher mean participation scores than female SI participants, but this was not a statistically significant difference.

The third demographic variable of interest was socioeconomic status (SES). For this study, SES was operationalized as level of family household income. The students were divided into six SES groups based on their self-reported level of family household income. There were no statistically significant differences in mean SI engagement scores, nor were there shown to be pattern differences among the SES groups with regard to engagement in SI.

Level of parent education was also analyzed. As part of the on-line survey, students were asked to indicate the highest level of educational attainment for each of their parents. Neither mother's nor father's level of education was shown to have a statistically significant relationship with SI engagement. There were statistically significant differences among the groups based on the interaction effect of mother and father education. The effect sizes for the differences were very small. While the results were shown not be statistically significant, it was interesting to note that the highest mean SI engagement scores were for students whose mothers had either never finished

high school or who had completed a graduate degree. Chi-square analysis showed no statistically significant pattern differences among the students based on the crosstabulation of SI attendance and parent education. It is then reasonable to conclude that level of parent education has little, if any, effect on their children's willingness to seek help by actively engaging in SI.

The next demographic variable considered was grade level classification. The results of both the GLM analysis and chi-square tests for pattern differences indicated that there were significant differences among the groups based on their grade level. Post hoc tests showed that the only statistically significant pairwise differences were between freshmen and seniors. The means plot for this variable indicated that the higher the students' grade level, the less likely they were to actively engage in SI.

Finally, the relationship between the students' college affiliation and SI engagement was considered. Univariate GLM analysis indicated that there were no statistically significant differences among the students based on their college. However, chi-square tests showed some significant pattern differences among the groups. Education, General Academics, and Liberal Arts students were the most likely students to be actively engaged in SI. Engineering and Agriculture students were least likely to be actively engaged.

FINDINGS FOR RESEARCH QUESTION TWO

Research Question Two: What is the relationship of the cognitive variables with engagement in SI?

Because academic assistance programming such as SI is designed to help students achieve success in college level classes, a good bit of attention has been given to whether students self-select such programs based on cognitive ability or academic achievement. Robbins et al. (2004) noted that high school grade point average and SAT scores are generally very good predictors of college grades. If the students who are already predicted to do well based on prior cognitive achievement are also most likely to engage in academic assistance programming, then positive results of such interventions could be considered to be related to the prior achievement rather than to the efficacy of the program.

Unfortunately, high school grades were not available for the students in this sample. High school rank information was collected and was originally planned to be used in the data analysis, but due to the nature of the student profile at Texas A&M University, high school rank was not useful for this analysis. For this sample of students, 84% of them were ranked in the top one quarter of their high school classes and 53% were ranked in the top ten percent. This restriction in range was deemed to be too extreme to be included in the final analysis of data.

There were three cognitive variables which were analyzed to determine whether there was a relationship with SI engagement: SAT verbal scores, SAT math scores, and cumulative college grade point ratio. Two separate analyses were run to address this research question. The first analysis was to determine simple bivariate correlations between SI engagement and the three cognitive variables. This analysis gave some indication of how these cognitive variables were related to SI engagement.

The second analysis was to look at these cognitive variables as a set by doing multivariate analysis. It has been noted that use of multivariate techniques are preferred for many situations because they help reduce the experiment-wise Type I error rates and often better reflect reality in social science applications (Fish, 1988; Huberty, 1994; Thompson, 1994). Stevens (2002) echoed this argument noting that multivariate analysis has great practical value in educational settings.

Correlational Analysis

The purpose of this analysis was to understand how the three measures of cognitive achievement were related to SI engagement. The cognitive variables included were SAT math score, SAT verbal score, and cumulative grade point ratio (GPR). The study was conducted during the spring 2004 semester, so the GPR data was cumulative as of the end of the Fall 2003 semester. The analysis looked at the bivariate correlations between the three cognitive measures and SI engagement.

Table 66 shows the correlations between the three cognitive measures and SI engagement. The results indicated that there was a statistically significant negative correlation between SI engagement and SAT math scores (r = -.089; $p < .008$). Similarly, there was a negative correlation between SAT verbal scores and SI engagement (r = -.124; $p < .001$). There was not a statistically significant relationship between cumulative GPR and SI engagement (r = .015; $p = .630$). The bivariate correlations indicated that students who were most prepared for college based on their college entrance scores were somewhat less likely to actively engage in SI than their less prepared peers. Cumulative GPR is a measure of actual achievement in academics. The fact that there was not a significant relationship between SI engagement and cumulative GPR indicated that any positive effect of SI on grades was most likely not an artifact of self-selection into SI of only high achieving students. This correlational analysis provided an interesting, but somewhat incomplete answer to research question two.

TABLE 66. Correlations Between Cognitive Variables and SI Engagement

		MATH SAT	VERBAL SAT	Cumulative GPR
Engagement	Pearson Correlation	-.089(**)	-.124(**)	.015
	Sig. (2-tailed)	.008	.000	.630
	N	879	879	988

** Correlation is significant at the 0.01 level (2-tailed).

Multivariate Analysis

The purpose of this analysis was to look at the cognitive variables as a set to more fully address the second research question. Before conducting the analysis, it was important to address the statistical assumptions for this type of analysis. Stevens (2002) and others (Bray & Maxwell, 1985; Thompson, 1996) noted that there are three major assumptions which must be addressed with Multivariate Analysis of Variance (MANOVA). The dependent variables for this analysis were the three cognitive variables. The fixed variable was level of SI engagement. The first statistical assumption that had to be satisfied was independence of observations. The fact that some students in the sample were enrolled in more than one of the targeted courses was a potential threat to this assumption. However, the students who fit this condition were removed from the sample.

The second assumption was that the dependent variables should have a multivariate normal distribution in each group. Stevens (2002) asserted that this assumption can usually be satisfied if each of the variables is normally distributed. A commonly used graphical test for normality is a normal probability (N-P) plot. These plots were created with all three cognitive variables for each of the SI engagement groups and upon visual inspection found to satisfy the normality assumption. In addition, non-graphical tests were conducted to check for normality. Table 67 shows the results of the non-graphical tests for normality for the three cognitive variables by group using the Shapiro-Wilk test for

normality as recommended by Stevens (2002). The results indicated that the data was normally distributed on the SAT variables, but the GPR variable may not have been normally distributed in all three groups based on this data set.

TABLE 67. Test of Normality: Cognitive Variables

		Shapiro-Wilk		
	Level of Engagement	Statistic	df	Sig.
MATH	Non SI	.996	1491	.001
	Low Engagement	.994	317	.282
	High Engagement	.996	179	.939
VERBAL	Non SI	.996	1491	.001
	Low Engagement	.991	317	.040
	High Engagement	.988	179	.145
CUMGPRNE	Non SI	.983	1491	.000
	Low Engagement	.979	317	.000
	High Engagement	.969	179	.000

A graphical test for multivariate normality was recommended by Stevens (2002) and detailed by Thompson (1990). The procedure involved producing a graphical representation of the Mahalanobis distance (D^2) and chi-square values for each subject based on the degrees of freedom equal to the number of variables in the analysis. Using the SPSS syntax suggested by George (2001), the procedure was conducted for the three cognitive variables. The result of the graphical test for normality procedure is the scatterplot shown in Figure 3. If the variables included have multivariate normality, the plot should approximate a straight line from the lower left to the upper right corner of the graph. Visual

inspection of this scatterplot supported the contention that the normality assumption was properly met.

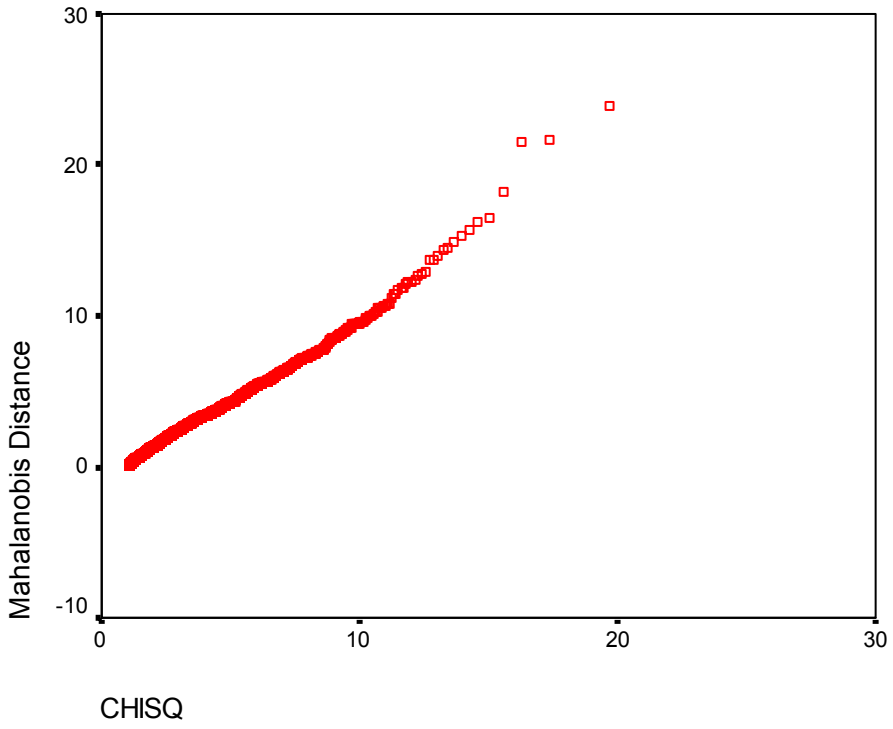

Figure 3. Graphical Plot of Multivariate Normality: Cognitive Vaiable Set. Perfectly normally distributed set of scores would produce a strait line graph from the lower left corner to the upper right corner.

The third assumption for MANOVA is homogeneity of the covariance matrices which is analogous to the homogeneity of variance assumption for ANOVA. Stevens (2002) and Thompson (1990) both recommend using Box's M test. If this assumption is met, then Box's M should not show statistical significance. Table 68 shows the results of the test for homogeneity of variance which indicated that the assumption has been met (Box's M = 12.450; p = .415).

TABLE 68. Box's Test of Equality of Covariance Matrices: Cognitive Variables

Box's M	12.450
F	1.032
df1	12
df2	1237845.581
Sig.	.415

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

For the GLM multivariate analysis, the three cognitive variables of SAT verbal, SAT math, and cumulative GPR were the dependent variables. The independent grouping variable for this analysis was the three levels of SI engagement described earlier in this chapter. The results shown in Table 69 indicate that there was a statistically significant overall difference in the three groups. This tells us that cognitive achievement as expressed by SAT scores and college GPR does have a significant relationship with engagement in SI, although it should be noted that the effect sizes were rather small (eta^2 = .011 to .019).

TABLE 69. Multivariate Tests for Cognitive Variables

Effect		Value	F	Hypoth. df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.969	20685.911(a)	3	1982	.000	.969
	Wilks' Lambda	.031	20685.911(a)	3	1982	.000	.969
	Hotelling's Trace	31.311	20685.911(a)	3	1982	.000	.969
	Roy's Largest Root	31.311	20685.911(a)	3	1982	.000	.969
Eng. Lev.	Pillai's Trace	.023	7.680	6	3966	.000	.011
	Wilks' Lambda	.977	7.697(a)	6	3964	.000	.012
	Hotelling's Trace	.023	7.714	6	3962	.000	.012
	Roy's Largest Root	.020	13.016(b)	3	1983	.000	.019

a Exact statistic
b The statistic is an upper bound on F that yields a lower bound on the significance level.

To better understand the overall results, post hoc analysis was conducted. The results of the post hoc analysis are displayed in Table 70. As recommended by Stevens (2002), Tukey's honestly significant difference (HSD) test was used for post hoc analysis in order to provide some protection against Type I error. The pairwise comparisons showed that for both SAT math and SAT verbal, there were significant differences between SI participants and non-SI participants. In both cases, students who did not go to any SI sessions had higher mean SAT scores than students who did engage in SI. There were no significant differences in the SAT scores for the SI participants regardless of whether they were included in the low or high engagement groups. The 95% confidence intervals for the mean differences between high engagement and low engagement SI students subsumed zero for both SAT verbal and SAT math and the estimated mean difference was less than two points for both variables.

TABLE 70. Multiple Post Hoc Comparisons (Cognitive Model)
Tukey HSD

Dep. Variable	(I) Level of Engagement	(J) Level of Engagement	Mean Diff. (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
MATH	Non SI	Low	17.74(*)	4.929	.001	6.18	29.30
		High	17.66(*)	6.304	.014	2.88	32.45
	Low	Non SI	-17.74(*)	4.929	.001	-29.30	-6.18
		High	-.08	7.451	1.000	-17.56	17.40
	High	Non SI	-17.66(*)	6.304	.014	-32.45	-2.88
		Low	.08	7.451	1.000	-17.40	17.56
VERBAL	Non SI	Low	20.35(*)	4.964	.000	8.70	31.99
		High	22.08(*)	6.349	.001	7.19	36.97
	Low	Non SI	-20.35(*)	4.964	.000	-31.99	-8.70
		High	1.74	7.504	.971	-15.86	19.34
	High	Non SI	-22.08(*)	6.349	.001	-36.97	-7.19
		Low	-1.74	7.504	.971	-19.34	15.86
CUM GPR	Non SI	Low	.0437	.04149	.544	-.0536	.1410
		High	-.1442(*)	.05306	.018	-.2686	-.0197
	Low	Non SI	-.0437	.04149	.544	-.1410	.0536
		High	-.1879(*)	.06271	.008	-.3350	-.0408
	High	Non SI	.1442(*)	.05306	.018	.0197	.2686
		Low	.1879(*)	.06271	.008	.0408	.3350

Based on observed means.
* The mean difference is significant at the .05 level.

The pairwise comparisons for cumulative GPR tell a slightly different story. For this variable, there was no significant mean difference between the non-SI participants and the students who were classified as low engagement (p = .544). However, there were statistically significance differences in mean cumulative GPR's comparing the high engagement students and the other two groups. The highly engaged SI participants had an estimated mean GPR of .144 points higher on a 4.0 scale than the non-SI students and .188 points higher than the low engagement group. Even though this result indicated that

those students who were most highly engaged in SI were students who had already shown the ability to achieve higher grades than the other two groups, it should be noted that the magnitude of this difference was very small. The lower bound of the 95% confidence intervals for the mean differences between the high engagement group and the non SI students was .0197 grade points. The lower bound of the mean difference was .0408 between the high engagement and low engagement groups.

These mean differences can be seen even more clearly in Tables 71-73 which show the homogenous subsets for the three cognitive variables. These tables show the estimated mean scores based on the sample. The true means in the population were probably different from these estimated means. Referring to the confidence interval data helps in the interpretation of these results.

TABLE 71. Homogenous Subsets for SAT Math
Tukey HSD

		Subset	
Level of Engagement	N	1	2
Low Engagement	317	568.58	
High Engagement	179	568.66	
Non SI	1491		586.32
Sig.		1.000	1.000

Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares
The error term is Mean Square(Error) = 6351.649.
a Uses Harmonic Mean Sample Size = 318.747.
b Alpha = .05.

TABLE 72. Homogenous Subsets for SAT Verbal
Tukey HSD

		Subset	
Level of Engagement	N	1	2
High Engagement	179	544.64	
Low Engagement	317	546.37	
Non SI	1491		566.72
Sig.		.960	1.000

Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares
The error term is Mean Square(Error) = 6441.750.
a Uses Harmonic Mean Sample Size = 318.747.
b Alpha = .05.

TABLE 73. Homogenous Subsets for Cumulative GPR
Tukey HSD

		Subset	
Level of Engagement	N	1	2
Low Engagement	317	2.8024	
Non SI	1491	2.8460	
High Engagement	179		2.9902
Sig.		.689	1.000

Means for groups in homogeneous subsets are displayed. Based on Type III Sum of Squares
The error term is Mean Square(Error) = .450.
a Uses Harmonic Mean Sample Size = 318.747.
b Alpha = .05.

Summary of Findings for Research Question Two

Research question two asked "What is the relationship of the cognitive variables with engagement in SI?" To answer this question, two sets of analyses were conducted. First, simple bivariate correlations were computed between SI engagement and the three cognitive variables. These results showed that there was a statistically significant negative correlation between SI engagement and both SAT verbal and SAT math scores. The bivariate

correlation between SI engagement and cumulative GPR was not statistically significant at the .05 level.

The second set of analyses for this research question involved using multivariate GLM to test the differences in the three cognitive factors as a set of dependent variables with the three levels of SI engagement as the independent variable. A multivariate method of analysis was chosen because of both the nature of the data and the desire to control for Type I error. The first step in this analysis was to conduct tests to assure that the data did not violate the statistical assumptions of MANOVA. Using both graphical and non-graphical methods, it was determined that the assumptions were met for this data.

A statistically significant overall difference was found among the three SI engagements groups considering the three cognitive variables as a set. In order to explore this overall difference more fully, post hoc analysis of the data was conducted. The post hoc analysis indicated that students who did not participate in SI had significantly higher mean SAT verbal and SAT math scores than students who did participate in SI. There were no significant differences in mean SAT math or verbal scores between the two groups of students who did participate in SI. SAT scores are considered to be a rather good indicator of college preparation and have traditionally been shown to be good predictors of first year grades. The fact that the SI participants had significantly lower SAT scores provided some evidence against the contention that high achieving students self-select into SI.

In analyzing the cumulative GPR variable, the high SI engagement group had a higher estimated mean GPR than either of the other two groups. The low SI engagement group had a lower mean GPR than the non SI participants, but there was not a statistically significant difference between the two groups. This result indicated that students who were most highly engaged in SI have demonstrated the ability to do well in college courses, but it should be noted that the magnitude of this difference was rather small. It is also important to note that the lowest mean GPR's among the three groups was in the low engagement group.

FINDINGS FOR RESEARCH QUESTION THREE

Research Question Three: What is the relationship of the motivational variables with engagement in SI?

The research literature suggests that help-seeking in academic settings can be understood as a component of self-regulated learning (Schunk, 2000; Zimmerman, 2001) and as a positive strategy in the achievement of educational goals (Karabenick, 1998). Most models of academic help-seeking emphasize the importance of motivational factors. The primary motivational theories which have been applied to academic help-seeking are goal theory (Alexitch, 1997; Karabenick, 2003), attribution theory (Magnusson and Perry, 1992), self-efficacy theory (Karabenick, 2003, Ryan, Gheen, and Midgley, 1998), self-regulated learning theory (Schunk, 2000; Zimmerman, 2001), implicit self-theories (Dweck, 1999; Hong et al., 1999), and social cognitive theory (Schunk, 2000). For this

study, motivational variables were measured using several scales from the Motivated Strategies for Learning Questionnaire (MSLQ) and a brief set of questions designed to determine implicit self-theories or view of intelligence. Table 74 shows the motivational scales used in the study and the corresponding motivation theory constructs.

TABLE 74. Study Variables and Corresponding Motivation Theory Constructs

Study Variables	Corresponding Motivation Theory Construct
Intrinsic Motivation	Goal Theory
Extrinsic Motivation	Goal Theory
View of Intelligence	Implicit Self-Theories
Task Value	Attribution Theory
Control Beliefs	Attribution Theory
Self-efficacy	Self-efficacy Theory
Organization	Self-regulated Learning Theory
Self-regulation	Self-regulated Learning Theory
Effort Regulation	Self-regulated Learning Theory
Peer Learning	Social Cognitive Theory/Self-regulated Learning Theory
Help-seeking	Social Cognitive Theory/Self-regulated Learning Theory

To address research question three, these 11 motivational variables were analyzed to determine what their relationship was with SI engagement. Two separate analyses were run to address this research question. The first analysis was to determine simple bivariate correlations between SI engagement and the 11 motivational variables. This analysis gave some indication of how these motivational variables were related to SI engagement. Just as in the analysis for research question two, the second analysis was to look at these motivational variables as a set using MANOVA. Motivation is a very complex concept and it

makes practical sense to consider these variables as a set in the analysis. There was also concern that the survey data might have some bias related to gender. This concern was raised in the discussion of the preliminary data analysis. To address this issue, a multivariate analysis was conducted to determine if there were significant differences in male and female students related to the motivational variables. There were no significant differences found ($F = 1.574$; $df = 11$; $p = .101$) and gender was not determined to be a mitigating factor in interpreting these results.

Correlational Analysis

The purpose of this analysis was to understand how the motivational variables were related to SI engagement. In order to understand the relationships between SI participation and motivation, there were three SI variables for which correlations were computed. The three variables were percentage of sessions attended, mean participation rating, and engagement, which was derived from the first two variables. Table 75 shows the bivariate correlations between the three SI variables and each of the motivational variables.

There were four motivational scales which did not have a statistically significant correlation with any of the three SI variables: intrinsic motivation, view of intelligence, task value, and self-regulation. Further exploration of these variables in the multivariate analysis helped in understanding how these

TABLE 75. Bivariate Correlations Between SI Measures and Motivational Variables

		% of Sessions Attended	Engagement	Participation
Intrinsic Motivation	Pearson Correlation	.000	.014	-.039
	Sig. (2-tailed)	.999	.662	.212
	N	1003	1003	1003
Extrinsic Motivation	Pearson Correlation	.108(**)	.112(**)	.085(**)
	Sig. (2-tailed)	.001	.000	.007
	N	1003	1003	1003
View of Intelligence	Pearson Correlation	.023	.028	.031
	Sig. (2-tailed)	.462	.377	.333
	N	1003	1003	1003
Task Value	Pearson Correlation	.041	.044	.025
	Sig. (2-tailed)	.191	.168	.423
	N	1003	1003	1003
Control Beliefs	Pearson Correlation	-.013	-.003	-.087(**)
	Sig. (2-tailed)	.673	.918	.006
	N	1003	1003	1003
Self-efficacy	Pearson Correlation	-.026	-.011	-.104(**)
	Sig. (2-tailed)	.403	.731	.001
	N	1003	1003	1003
Organization	Pearson Correlation	.070(*)	.077(*)	.064(*)
	Sig. (2-tailed)	.027	.015	.042
	N	1002	1002	1002
Self-regulation	Pearson Correlation	.023	.038	.019
	Sig. (2-tailed)	.465	.226	.542
	N	1003	1003	1003
Effort Regulation	Pearson Correlation	.076(*)	.076(*)	.038
	Sig. (2-tailed)	.015	.016	.228
	N	1003	1003	1003
Peer Learning	Pearson Correlation	.088(**)	.091(**)	.121(**)
	Sig. (2-tailed)	.005	.004	.000
	N	1003	1003	1003
Help-seeking	Pearson Correlation	.141(**)	.143(**)	.159(**)
	Sig. (2-tailed)	.000	.000	.000
	N	1003	1003	1003

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

variables contributed to the overall model. Two other variables, control beliefs and self-efficacy, did not have statistically significant correlations with SI engagement or percentage of sessions attended, but did have a statistically significant correlation with mean SI participation. In both cases, the direction of the correlation was negative. High self-efficacy implies a lack of confidence in the academic domain and students with lower self-efficacy, while willing to attend SI sessions, may have been less willing to actively participate.

The negative correlation between control beliefs and mean participation may be a similar dynamic. Students scoring low on this scale would be less likely to feel that their efforts would result in positive outcomes. For this reason, these students may have been more passive in their learning and even if they had attended SI, they may have been less willing to fully engage in the process.

The motivational variables with the strongest relationships to active participation in SI were help-seeking, extrinsic motivation, and peer learning. Help-seeking had a positive relationship with all three SI measures. Because help-seeking was designed to be a measure of the student's willingness to seek help when needed, this result may in one respect provide some construct validity to this particular scale on the MSLQ. The same could be said of the peer learning variable which also had a generally small, but positive, correlation with the SI measures. Other than the help-seeking scale, extrinsic motivation had the strongest correlations with the three SI variables. Extrinsic motivation measures a student's perception that engagement in learning tasks is a means

to an end. A high score on this scale implies that the student places a high value on rewards such as grades or recognition which may be realized through engagement in learning tasks. Extrinsic and intrinsic motivation are not understood to be opposite points on a continuum, but rather are independent constructs. Students who had strong extrinsic motivation for learning may have perceived that participation in SI was an important avenue for achieving the outward rewards which they value.

The final two variables which had statistically significant correlations with the SI measures were organization and effort regulation. Both of these variables are related to self-regulated learning theory. Effort regulation measures students' perception that they are able to persist through difficulty. This scale had a statistically significant positive correlation with SI engagement and percentage of sessions attended, but did not have a statistically significant relationship to mean participation rating. It is probably accurate to say that attending SI or seeking academic assistance of any kind is not a convenient thing for a student to do. There are no incentives for attending SI sessions other than the opportunity to learn the course material. Students with high effort regulation scores may have been students who were willing to do something which was less than convenient if it helped them achieve their academic goals.

Organization is a measure of the students' self-reported use of organizational strategies for learning. It is primarily a measure of study habits. This variable had a statistically significant positive correlation with all three

measures of SI involvement. SI leaders are trained to help students develop organizational strategies for learning course material rather than relecturing or reteaching the course content. Students with high scores on this scale may have been drawn to SI as a source of help since it emphasizes these organizational strategies.

Multivariate Analysis

The correlational analysis was helpful in understanding the relationship between the motivational factors and SI engagement, but to understand this relationship better it was important to employ multivariate methods. Motivation as a construct is a complex interaction of many different factors. Looking at these motivational factors as a set in a multivariate analysis reflected this complexity. In addition, it allowed for analysis of interaction among and between factors which helped shed light on the dynamics of help-seeking in the context of SI.

As with the multivariate analysis of the cognitive factors, it was necessary to first determine if the statistical assumptions had been properly met. Again, it should be noted that there were three primary assumptions that needed to be met. Any violation of the assumptions required adjustment to the analysis and the interpretation of the results.

The first assumption was the independence assumption. Stevens (2002) noted that violation of the assumption of independent observations is more common in social science research than would be implied by the light treatment

that is often given to the subject in many statistics books. A violation of this assumption is considered to be very serious (Stevens, 2002). Most often this assumption is violated with classroom research where cooperative learning is involved or where one factor such as a disrupted environment may have an effect on an entire group of students. The motivational variables in this study do not violate the independent observation assumption. All of the dependent variables in this multivariate analysis are based on the on-line survey which was administered for this study. Each survey was completed by the students, independent of each other and outside of class time.

The second assumption was that the data set should have multivariate normality within each group. According to Stevens (2002), the first step in testing for this assumption is to test the univariate normality of each variable. The graphical test for normality is a normal probability (N-P) plot. These plots were run for all 11 of the motivational variables and found to satisfy the normality assumption upon visual inspection. In addition, non-graphical tests were conducted to test for normality. Table 76 shows the results of the non-graphical tests for normality for the 11 motivational variables by group. Many of the variables would not be considered normally distributed within the groups based on the Shapiro-Wilk test. However, this result could be considered an artifact of the very large sample sizes of the groups.

TABLE 76. Shapiro-Wilk Test of Normality for Motivational Variables

		Shapiro-Wilk		
	Level of Engagement	Statistic	df	Sig.
Intrinsic Motivation	Non SI	.987	729	.000
	Low Engagement	.985	150	.095
	High Engagement	.979	123	.057
Extrinsic Motivation	Non SI	.942	729	.000
	Low Engagement	.942	150	.000
	High Engagement	.897	123	.000
View of Intelligence	Non SI	.966	729	.000
	Low Engagement	.972	150	.004
	High Engagement	.955	123	.000
Task Value	Non SI	.977	729	.000
	Low Engagement	.983	150	.058
	High Engagement	.972	123	.013
Control Beliefs	Non SI	.954	729	.000
	Low Engagement	.972	150	.004
	High Engagement	.945	123	.000
Self-efficacy	Non SI	.957	729	.000
	Low Engagement	.982	150	.046
	High Engagement	.957	123	.001
Organization	Non SI	.987	729	.000
	Low Engagement	.986	150	.140
	High Engagement	.985	123	.188
Self-regulation	Non SI	.996	729	.108
	Low Engagement	.991	150	.438
	High Engagement	.973	123	.016
Effort Regulation	Non SI	.985	729	.000
	Low Engagement	.982	150	.052
	High Engagement	.973	123	.015
Peer Learning	Non SI	.968	729	.000
	Low Engagement	.979	150	.020
	High Engagement	.976	123	.028
Help-seeking	Non SI	.986	729	.000
	Low Engagement	.983	150	.059
	High Engagement	.986	123	.248

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

The graphical test for multivariate normality was run for this data set using the SPSS syntax suggested by George (2001). The graphical plot produced by this procedure can be interpreted in the same way as normal-probability (N-P) which are routinely used to test for univariate normality. Normally distributed data should plot closely along a straight line running from the bottom left to the top right of the chart. This graphical plot can be seen in Figure 4 and it does appear to support the contention that the normality assumption was satisfied.

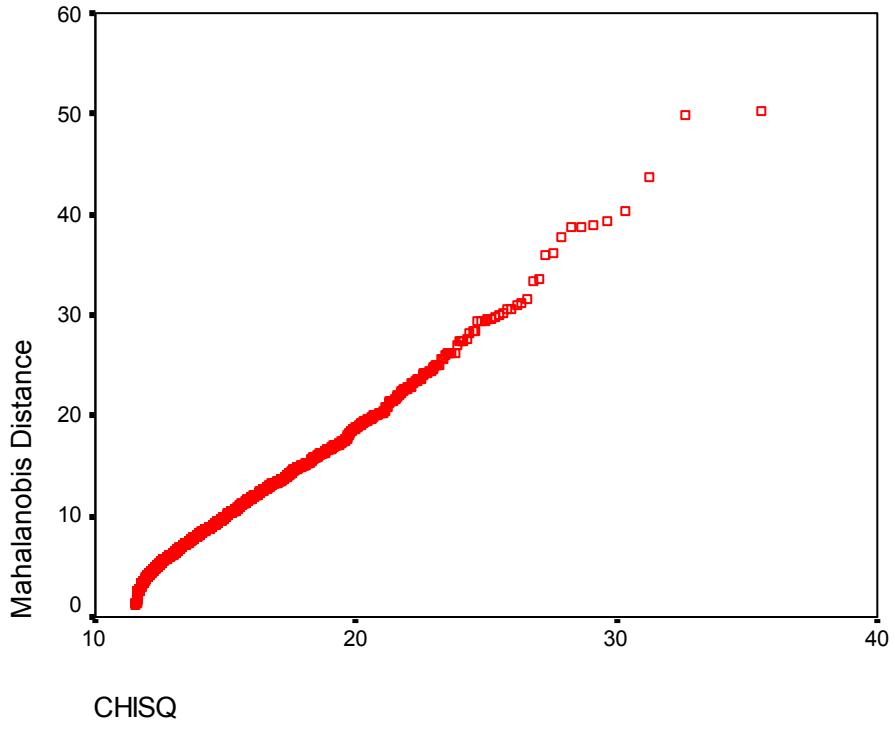

Figure 4. Graphical Plot of Multivariate Normality: Motivational Variable Set. A perfectly normally distributed set of scores would produce a strait line graph from the lower left corner to the upper right corner.

The third and final statistical assumption which must be satisfied is that there should be homogeneity of the covariance matrices. Stevens (2002) and others recommend using the Box test to verify that this assumption has been met. Results of the Box test for the motivational variables shown in Table 77 suggest that this assumption has been violated. Violation of this assumption may not be problematic, however. According to Stevens (2002), violations of this assumption are very common in studies where there are unequal group sizes. In addition, Box's test is very sensitive to non-normality of the data. The deviation from normality for this set of variables may have been severe enough to affect the Box test.

TABLE 77. Box's Test of Equality of Covariance Matrices: Motivational Variables

Box's M	201.321
F	1.480
df1	132
df2	352635.475
Sig.	.000

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

The violation of this assumption primarily affects the interpretation of the data and it was the judgment of the researcher that the data did not need to be transformed in order to better meet this assumption. Stevens (2002) suggested that when the homogeneity assumption is violated in MANOVA it may affect the

power of the data analysis when groups are of unequal size. In a *k*-group analysis, if the largest groups have the largest variance in data, then the statistical tests will tend to be more conservative. If the opposite is true, then the tests will give more liberal results. For this study, it is the case that the largest group (non-SI participants) had more general variance than the two smaller groups. For this reason it was reasonable to conclude that the statistical results were more conservative. In this situation, it is recommended that data transformation not be done unless there are power concerns (Stevens, 2002). Because of the large sample size in this study, power was not a concern and it was determined that this violation of the homogeneity assumption would not adversely affect the results of the study.

For the GLM multivariate analysis, the 11 standardized motivational variables were the dependent variables. The independent grouping variable for this analysis was the three levels of SI engagement: non-SI, low engagement, and high engagement. The results shown in Table 78 indicated that there was a statistically significant overall difference in the three groups. Motivation did have a significant relationship to engagement in SI. The overall effect sizes for this analysis were obviously very small (Eta^2 = .03). One possible reason for this small effect size may have been the lack of homogeneity of the covariance matrices. As suggested in the previous paragraph, this situation may lead to some conservative bias in the results.

TABLE 78. Multivariate Tests for Cognitive Variables

Effect		Value	F	Hypoth. df	Error df	Sig.	Partial Eta^2
Intercept	Pillai's Trace	.030	2.774(a)	11	989	.001	.030
	Wilks' Lambda	.970	2.774(a)	11	989	.001	.030
	Hotelling's Trace	.031	2.774(a)	11	989	.001	.030
	Roy's Largest Root	.031	2.774(a)	11	989	.001	.030
ENGLEVEL	Pillai's Trace	.080	3.763	22	1980	.000	.040
	Wilks' Lambda	.921	3.788(a)	22	1978	.000	.040
	Hotelling's Trace	.085	3.813	22	1976	.000	.041
	Roy's Largest Root	.068	6.158(b)	11	990	.000	.064

a Exact statistic
b The statistic is an upper bound on F that yields a lower bound on the significance level.

Even with this small effect size, it was reasonable that there be follow-up analysis to explore the nature of the differences in motivation among the three groups of students. Because the large number of variables increased the likelihood of Type I error in traditional post hoc analysis and in order to develop more easily interpretable analysis for this set of variables, it was determined that the data should be analyzed using discriminant analysis. Bray and Maxwell (1985) recommended using discriminant analysis as an alternative to traditional post hoc tests to interpret a significant overall MANOVA result for designs with a large number of dependent variables. Stevens (2002) also favored this approach because it allows for both “clarity of interpretation” and “parsimony of description” (p. 286). There are four statistical assumptions for discriminant analysis: independent observations, multivariate normality, homogeneity of the covariance matrices, and unique group membership. The first two assumptions

have been met as described earlier. The violation of the homogeneity of covariance assumption was not particularly problematic in this analysis. Several studies have noted that not only is this a fairly common issue, but that it seldom affects the overall results of the analysis (Huberty & Wisenbaker, 1992; Huberty, 1994; McGee, 2003). The fourth assumption is that each subject may only be a member of one of the groups. Because the students who were in multiple course sections were eliminated from the analysis, this assumption was not violated.

For the purpose of using discriminant analysis in place of post hoc tests for MANOVA, there are two sets of results that can be interpreted: the standardized coefficients and the structure coefficients. The standardized discriminant function coefficients are analogous to Beta weights in multiple regression. They provide information about the relative importance of each variable within the model. The structure coefficients are correlation coefficients between the individual variables and the discriminant functions (also called canonical functions). Stevens (2002) suggested that either set of coefficients could be interpreted and gave rationale for selecting which one to interpret. Bray and Maxwell (1985) noted that both coefficients may be important because they answer different questions. There are also some persuasive arguments that in all analyses that fall under the General Linear Model that both standardized weights and structure coefficients need to be interpreted (Courville, T., & Thompson, B., 2001; Thompson, B., 1992).

Discriminant analysis breaks down the total variance from the MANOVA into linear combinations of the variables. These linear combinations are referred to as discriminant functions or canonical discriminant functions. An analysis can produce up to $k - 1$ number of functions with k denoting the total number of groups. The eigenvalues and the Wilk's significance test results for the canonical discriminant functions using the motivational variables are displayed in Tables 79 and 80.

TABLE 79. Eigenvalues of Canonical Discriminant Functions (Motivational Variables)

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.068(a)	80.6	80.6	.253
2	.016(a)	19.4	100.0	.127

a First 2 canonical discriminant functions were used in the analysis.

TABLE 80. Wilks' Lambda for Discriminant Functions (Motivational Variables)

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	.921	82.046	22	.000
2	.984	16.255	10	.093

The results in Table 79 show that the analysis produced two discriminant functions. The first function had an eigenvalue of .068 and explained 80.6% of the variance in the model. This first function was statistically significant ($p < .001$). The second function was not statistically significant ($p = .093$) and only accounted for the remaining 19.4% of the variance in the model. This second

function will not be interpreted. The Wilks' Lambda of .912 for function one is a measure of effect size for this analysis. To convert Wilks' Lambda to the same metric as other effect size measures, it should be subtracted from 1 leaving a residual value of .088 which is a rather small effect size.

The purpose of this analysis was to understand how these motivational variables as a set helped discriminate between the three groups of students: non-SI attendees, low engagement, and high engagement. The interpretable canonical function (Table 79) represented some underlying dimension or construct of the set of variables which helped discriminate among the three groups. The structure matrix (Table 81) shows the structure coefficients associated with the two canonical functions. According to Klecka (1980), a structure matrix can be used to "name" (p. 31) a function based on the set of variables with which it is most highly correlated. The variables in the matrix are sorted by largest absolute value under function one. It was apparent that there were six variables which were highly correlated with the underlying construct derived from this model. Based on the researcher's understanding of the variables and the groups which were classified, it was reasonable to identify the underlying dimension of this function as "academic help-seeking".

TABLE 81. Structure Matrix for Discriminant Functions

	Function	
	1	2
Help-seeking	.616(*)	.262
Peer Learning	.462(*)	-.053
Self-efficacy	-.448(*)	.369
Control Beliefs	-.373(*)	.300
Extrinsic Motivation	.343(*)	.196
Organization	.229(*)	.159
Intrinsic Motivation	-.190	.396(*)
Effort Regulation	.172	.305(*)
Task Value	.094	.227(*)
Self-regulation	.074	-.215(*)
View of Intelligence	.085	.163(*)

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions
Variables ordered by absolute size of correlation within function.

* Largest absolute correlation between each variable and any discriminant function

The remaining five variables in the matrix have higher absolute value correlations with the second function, which was not statistically significant and deemed to be unimportant for this analysis. The variable with the highest correlation to function one was help-seeking (r = .616), which gives a little more construct validity to this particular MSLQ scale. The other variables which were most highly correlated with this function were peer learning (r = .462), self-efficacy (r = -.448), control beliefs (r = -.373), extrinsic motivation (r = .343), and organization (r = .229).

The standardized canonical discriminant function coefficients for this analysis can be seen in Table 82. This matrix is also sorted by highest absolute value of the coefficients with function one. The function coefficients are

TABLE 82. Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
Self-efficacy	-.736	.311
Help-seeking	.498	.536
Task Value	.419	-.140
Intrinsic Motivation	-.419	.570
Extrinsic Motivation	.389	.077
Effort Regulation	.309	.516
Peer Learning	.113	-.361
Self-regulation	-.099	-1.228
Organization	.082	.423
View of Intelligence	.033	.046
Control Beliefs	.025	.073

analogous to Beta weights in multiple regression. The coefficients give information about which variables in the analysis contribute the most to determining the discrimination scores on each function. There were some interesting dynamics that were revealed in this analysis. Self-efficacy (-.736) had the largest absolute value function coefficient in the model followed by help-seeking (.498) and extrinsic motivation (.389). These three variables have consistently shown up in this analysis as being important. Peer learning (.113) was highly correlated with the discriminant function (see Table 81), but had a low discriminant function coefficient. This was most likely the result of multicollinearity in the data. Peer learning was highly correlated with several of the other motivational variables, especially help-seeking (r = .682). This information is available in Table 83. As is often the case in linear models, when

variables overlap, only one will get the “credit” for the explained variance. Because peer learning was highly correlated with help-seeking and help-seeking had already been assigned a high weight in the equation, there was not much weight left to assign peer-learning in the model.

The next two variables, intrinsic motivation (-.419) and task value (.419) had not previously seemed to contribute much to the analysis. These variables were not highly correlated with measures of SI engagement (see Table 75) or with the canonical function (see Table 81). These variables do, however, contribute signficant weight to the model. They may be interpreted as suppressor variables. Suppressor variables are factors which are correlated with one or more predictor variables, but have a close to zero correlation with the dependent variable (Thompson, 1992). It is possible that both intrinsic motivation and task value fit this definition. Table 83 shows the bivariate correlations between these two variables and the five motivational variables which have the highest correlations with SI engagement. There is a great deal of multicollinearity among these variables. As Thompson noted in his discussion of suppressor variables, they are difficult to explain, but essentially serve the purpose of taking the influence of one variable out of the mix in order to increase the overall predictive power of the model. In this case, it may be that intrinsic motivation and task value were not strongly related to help-seeking, but taking them into account helps improve the overall predictive model.

TABLE 83. Correlations of a Selected Set of Motivational Variables

		Intrinsic Motiv.	Task Value	Self-efficacy	Organiz.	Peer Learning	Help-seeking	Extrinsic Motiv.
Intrinsic Motivation	Pearson Correlation	1	.695(**)	.549(**)	.310(**)	.233(**)	.175(**)	.290(**)
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.000
	N	1003	1003	1003	1002	1003	1003	1003
Task Value	Pearson Correlation	.695(**)	1	.517(**)	.308(**)	.208(**)	.152(**)	.373(**)
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000
	N	1003	1003	1003	1002	1003	1003	1003
Self-efficacy	Pearson Correlation	.549(**)	.517(**)	1	.227(**)	.077(*)	.049	.313(**)
	Sig. (2-tailed)	.000	.000	.	.000	.015	.118	.000
	N	1003	1003	1003	1002	1003	1003	1003
Organiz.	Pearson Correlation	.310(**)	.308(**)	.227(**)	1	.345(**)	.289(**)	.268(**)
	Sig. (2-tailed)	.000	.000	.000	.	.000	.000	.000
	N	1002	1002	1002	1002	1002	1002	1002
Peer Learning	Pearson Correlation	.233(**)	.208(**)	.077(*)	.345(**)	1	.682(**)	.165(**)
	Sig. (2-tailed)	.000	.000	.015	.000	.	.000	.000
	N	1003	1003	1003	1002	1003	1003	1003
Help-seeking	Pearson Correlation	.175(**)	.152(**)	.049	.289(**)	.682(**)	1	.146(**)
	Sig. (2-tailed)	.000	.000	.118	.000	.000	.	.000
	N	1003	1003	1003	1002	1003	1003	1003
Extrinsic Motivation	Pearson Correlation	.290(**)	.373(**)	.313(**)	.268(**)	.165(**)	.146(**)	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.
	N	1003	1003	1003	1002	1003	1003	1003

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Summary of Findings for Research Question Three

Research question three asked "What is the relationship of the motivational variables with engagement in SI?" To answer this question, two sets of analyses were conducted. First, simple bivariate correlations were computed between three measures of SI participation and the 11 motivational

variables. These results revealed that 7 of the 11 variables had statistically significant correlations with at least one of the measures of SI participation. The variables were extrinsic motivation, organization, self-efficacy, effort regulation, control beliefs, peer learning, and help-seeking. Of the seven variables, only control beliefs and self-efficacy had negative correlations with the SI participation variables. All of these correlations had rather small effect sizes.

The second set of analyses for this research question involved using multivariate GLM to conduct a MANOVA with the 11 motivational factors as the dependent variables and the three levels of SI engagement as the independent variable. A multivariate method of analysis was chosen because of both the nature of the data and the desire to control for Type I error. The first step in this analysis was to conduct tests to assure that the data did not violate the statistical assumptions of MANOVA. Using both graphical and non-graphical methods, it was determined that the assumptions of independent observations and multivariate normality were met for this analysis, but that the homogeneity assumption was mildly violated. However, due to the nature of the violation, it was determined that the result would be a more conservative test for statistical significance which was attenuated by the large sample size.

The MANOVA results did indicate a statistically significant overall difference in the three SI engagement groups considering the 11 motivational variables as a set. In order to explore this overall difference more fully, post hoc analysis of the data was conducted using discriminant analysis. The

discriminant analysis has helped shed some light on the results of the MANOVA by providing some information about an underlying construct which discriminated among the SI engagement groups. This construct has been labeled by this researcher as “academic help-seeking.”

Analysis of the structure matrix revealed six primary motivational factors which were highly correlated with the canonical function. In order of magnitude these factors were help-seeking, peer learning, self-efficacy, control beliefs, extrinsic motivation, and organization. Of the six, all except for self-efficacy and control beliefs had a positive correlation with the discriminant function.

The other information available from the discriminant analysis was the resulting standardized canonical discriminant function coefficients. Like Beta weights in regression analysis, these coefficients are uncorrelated weights for the canonical function. The canonical discriminant function was the mathematical equation based on the set of motivational variables which provided discrimination among the three SI engagement groups. Based on these results, it was found that self-efficacy, help-seeking, and extrinsic motivation had the highest function coefficients among the variables which had previously been identified as having a significant relationship with academic help-seeking. In addition, it was suggested that intrinsic motivation and task value may be operating as suppressor variables meaning that taking these two variables into account strengthens the predictive model.

The variables which appeared to have very little relationship with academic help-seeking in general, and SI engagement in particular, were view of intelligence and self-regulation. Based on the review of the literature, these two variables would be expected to be very good predictors of academic help-seeking. In the case of self-regulation, the explanation for this result may be that this variable was highly correlated with several of the other variables. In the multivariate analysis, the self-regulation variable contributed very little unique variance to the equation. However, it should be noted that self-regulation did not have statistically significant bivariate correlations with either SI engagement in the correlational analysis or with the first canonical discriminant function in the discriminant analysis. For these reasons, this variable did not add much, if any, value to the model.

In the case of the view of intelligence variable, there are at least two possible explanations. One possibility is that the underlying construct of view of intelligence is not applicable to academic help-seeking. While there has been some empirical evidence of a correlation between understanding of intelligence and help-seeking (Dweck, 1999), help-seeking is not the primary focus of Dweck's self-theories model. Another possibility is that the measure used for this variable had too much error variance and thus did not accurately discriminate the students in the sample. In either case, the results would indicate that as currently constructed, this variable does not shed much light on the phenomenon of academic help-seeking or SI engagement.

FINDINGS FOR RESEARCH QUESTION FOUR

Research Question Four: What is the relationship of level of SI engagement with success in the targeted courses?

If the findings of the first three research questions are to have any practical significance for the field of academic assistance administration, then the answer to this final research question must reveal a positive effect for engagement in SI. Understanding the characteristics of the students who actively engage in academic assistance is a wholly uninteresting line of inquiry if the intervention provides no positive effects. It becomes an important line of inquiry to the extent that the intervention is effective.

As outlined in the review of the literature, the National Center for Supplemental Instruction at the University of Missouri, Kansas City has had three claims validated by the U.S. Department of Education related to SI effectiveness (Center for Supplemental Instruction [CSI], 2000). In brief, these claims are that SI participants earn higher mean course grades than non participants, that SI participants persist in courses at a higher rate than non participants, and that SI students persist at the university longer than non participants. The results outlined in this section relate to the first two claims.

In order to answer this research question, the first step was to define what measures would constitute success in the targeted courses. Typically, success has been measured by final course grades and measures of persistence (Robbins et al., 2004). In this study, a final numerical grade was

available for each student enrolled in the targeted courses except for one section of History for which only a letter grade was made available to the researcher. In the subsequent analysis, the History section was considered separately from the other seven courses. Course persistence can be measured by successful completion of the targeted courses. It is common practice among SI administrators to define course persistence as completing a course with a final grade of A, B, C, or S (satisfactory). By contrast, attrition has been defined as earning a D, F, or U (unsatisfactory) final course grade or dropping a course before the end of the semester (Arendale, 1994).

There were three sets of data analyses conducted to answer this research question. The first set of analysis looked at how the three levels of SI engagement were related to final course grades. For the seven courses where final numerical grades were provided by the faculty members, the dependent variable for the analysis was a standardized final course grade. Non parametric methods were used to analyze final course grade differences for the remaining course. The second set of analyses utilized crosstabulations to determine the relationships between course persistence and level of SI engagement. The final set of analyses looked at the relationship between success in the targeted courses and SI engagement controlling for cognitive and motivational factors which were shown to be related to SI engagement.

Relationship between level of SI engagement and final course grades

One consideration in analyzing grade data was that numerical grade be standardized across the eight courses. Table 84 shows descriptive data for the final numerical grades by course sections. It is apparent looking at these statistics that scores needed to be converted to a standard metric in order to make comparisons across course sections. The final course grades were converted to a standard score with a mean of 50 and a standard deviation of 10. The descriptive statistics for this standardized data are shown in Table 85.

TABLE 84. Descriptive Statistics: Final Average by Course Section

COURSE	N	Min.	Max.	Mean	SD
BIOL 113	268	23.8	96.9	78.53	12.823
BIOL 114	584	33.9	99.4	76.27	11.666
CHEM 102	282	4.0	98.9	64.73	22.306
CHEM 228	174	34.6	97.7	72.96	12.744
HIST 106-515	146	36.7	97.3	80.70	10.502
HORT 201	332	16.0	98.0	79.77	11.273
POLS 206	469	6.5	96.5	72.28	12.840

TABLE 85. Descriptive Statistics: Standardized Final Grade

COURSE	N	Min.	Max.	Mean	SD
BIOL 113	268	7.19	64.37	50.00	10.0
BIOL 114	584	13.68	69.83	50.00	10.0
CHEM 102	282	21.28	65.23	50.00	10.0
CHEM 228	174	19.83	69.47	50.00	10.0
HIST 106-515	146	7.92	65.89	50.00	10.0
HORT 201	332	-6.66	66.19	50.00	10.0
POLS 206	469	-1.28	68.88	50.00	10.0

One problem with this data which was a concern related to outliers. Looking at Table 85, there seem to be no problems with outliers at the upper end of the distributions. The maximum grade for all eight courses was within a range of approximately five points. The standardized final grades have a mean of 50 and a standard deviation of 10. This means that the maximum scores are all less than two standard deviations above the mean. At the low end, however, there were some problems with outliers. Two courses had negative minimum standardized scores. In other words, these minimum scores were more than five standard deviations below the mean. The courses with the smallest ranges of scores were Chemistry 102 and 228. In both of these courses, the minimum score was less than three standard deviations below the mean.

The most plausible explanation for the extreme outliers at the low end of the distribution in the remaining courses was that there were students who started the semester and took one or more tests, but subsequently quit going to class without officially dropping the course. Using guidelines from Hinkle, Wiersma, and Jurs (1998), outliers at the reasonable lower bound were removed for the subsequent analysis. Table 86 shows the revised descriptive data by course section after the outliers had been removed. It should be noted that removing the outliers lowered the standard deviations of scores within most course sections, but had only a very slight effect on the means. All subsequent analysis of the data used the revised standard scores.

TABLE 86 . Descriptive Statistics: Standardized Final Grade by Course Sections (Outliers Removed)

COURSE	N	Minimum	Maximum	Mean	SD
BIOL 113	264	20.48	64.37	50.6	8.96
BIOL 114	580	21.31	69.83	50.3	9.62
CHEM 102	282	21.28	65.23	50.0	10.00
CHEM 228	173	23.34	69.47	50.2	9.79
HIST 106-515	145	21.94	65.89	50.3	9.43
HORT 201	328	21.33	66.19	50.6	8.43
POLS 206	460	20.94	68.88	50.8	8.19

The next consideration for this analysis was that the data meet the proper statistical assumptions. The assumptions for univariate GLM (ANOVA) are the following:

1. The observations are independent.
2. The observations are normally distributed on the dependent variable in each group.
3. The population variances for the groups are equal, often referred to as the homogeneity of variance assumption. (Stevens, 2002)

It was assumed by the researcher that the final course grades met the first assumption. It is possible that this assumption could have been violated if the final course grade was in part or in whole based on collaboration between students. It was not the determination of the researcher that this was the case.

The normality assumption can be tested using graphical and non-graphical methods. The non-graphical statistical test for normality of the dependent variable is displayed in Table 87. It is reasonable to conclude that there was a slight violation of the normality assumption with this data.

Fortunately, this violation has very minimal effect on the ANOVA results and transformation of the data is not recommended (Hinkle, Wiersma, and Jurs, 1998).

TABLE 87. Tests of Normality: Standard Scores by Level of SI Engagement

		Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Level of Engagement	Statistic	df	Sig.	Statistic	df	Sig.
Standard Scores	Non SI	.056	1543	.000	.973	1543	.000
	Low	.072	317	.000	.975	317	.000
	High	.070	183	.027	.978	183	.006

a Lilliefors Significance Correction

The third statistical assumption was that there was homogeneity of variance across groups. The results of the statistical tests for this assumption are displayed in Table 88. These results indicated that this assumption was violated, although it should be noted that the sample size for this analysis was quite large. Just as in MANOVA, violation of this assumption requires some adjustment in interpretation of the test statistics. It is the case with this data set that the largest total variance was in the group with the largest number of subjects. In this situation, the statistical tests will tend to be overly conservative (Hinkle, Wiersma, and Jurs, 1998).

TABLE 88. Test of Homogeneity of Variance (Standard Scores)

		Levene Statistic	df1	df2	Sig.
Standard Scores	Based on Mean	9.565	2	2040	.000
	Based on Median	7.407	2	2040	.001
	Based on Median and with adjusted df	7.407	2	1980.747	.001
	Based on trimmed mean	8.551	2	2040	.000

The Univariate GLM summary table for this analysis is displayed in Table 89. The results show that there was a statistically significant main effect (p < .001; F = 11.636) based on levels of SI engagement with standard scores as the dependent variable. This indicated that the mean standardized final grades of the students in the sample were significantly different depending on their level of engagement in SI. The Adjusted R Squared effect size for this analysis was .010 which means that approximately 1% of the total variance in the three groups was explained by their level of SI engagement. While this may not at first glance appear to be a noteworthy result, it should be remembered that the students also differed on several of the cognitive and motivational measures. More analysis was needed to fully understand this result.

TABLE 89. Tests of Between-Subjects Effects (Engagement Level)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta^2
Corrected Model	1939.127(a)	2	969.564	11.636	.000	.011
Intercept	2544985.621	1	2544985.621	30542.632	.000	.937
ENGLEVEL	1939.127	2	969.564	11.636	.000	.011
Error	169984.392	2040	83.326			
Total	5372316.369	2043				
Corrected Total	171923.519	2042				

a R Squared = .011 (Adjusted R Squared = .010)

Because of the statistically significant main effect, it was necessary to conduct post hoc analysis on this data so that it could be determined how the three groups differed from one another. The post hoc analysis was conducted using the Tukey honestly significant difference (HSD) test to protect against Type I error. The results of the post hoc analysis can be seen in Table 90. The only statistically significant mean differences ($p < .001$) among the groups were between the high engagement group and the other two groups.

TABLE 90. Post Hoc Multiple Comparisons (Engagement Level)

(I) Level of Engagement	(J) Level of Engagement	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Non SI	Low	.3856	.56290	.772	-.9346	1.7059
	High	-3.3113(*)	.71368	.000	-4.9851	-1.6374
Low	Non SI	-.3856	.56290	.772	-1.7059	.9346
	High	-3.6969(*)	.84746	.000	-5.6846	-1.7093
High	Non SI	3.3113(*)	.71368	.000	1.6374	4.9851
	Low	3.6969(*)	.84746	.000	1.7093	5.6846

Based on observed means.
* The mean difference is significant at the .05 level.

A better picture of the differences in the three groups can be seen looking at the estimated marginal means and the 95% confidence intervals. Table 91 shows the estimated marginal means and confidence intervals for the three groups on the dependent variable of standard scores. A graphical representation of the same data can be seen in Figures 5 and 6. Figure 5 is a means plot of the three groups based on the estimated marginal means. It shows dramatically how the high SI engagement group outperformed the other two groups in the targeted SI courses. Figure 6 is an error bar based on the 95% confidence intervals. As is graphically illustrated in this figure, there is no overlap between the confidence intervals for the mean between the high engagement group and the other two groups. This provides strong evidence that the difference in means was not an artifact of measurement error, but reflects a true difference in the population.

TABLE 91. Estimate of Means of Standard Scores by Level of Engagement

			95% Confidence Interval	
Level of Engagement	Mean	Std. Error	Lower Bound	Upper Bound
Non SI	50.216	.232	49.760	50.672
Low Engagement	49.830	.513	48.825	50.836
High Engagement	53.527	.675	52.204	54.850

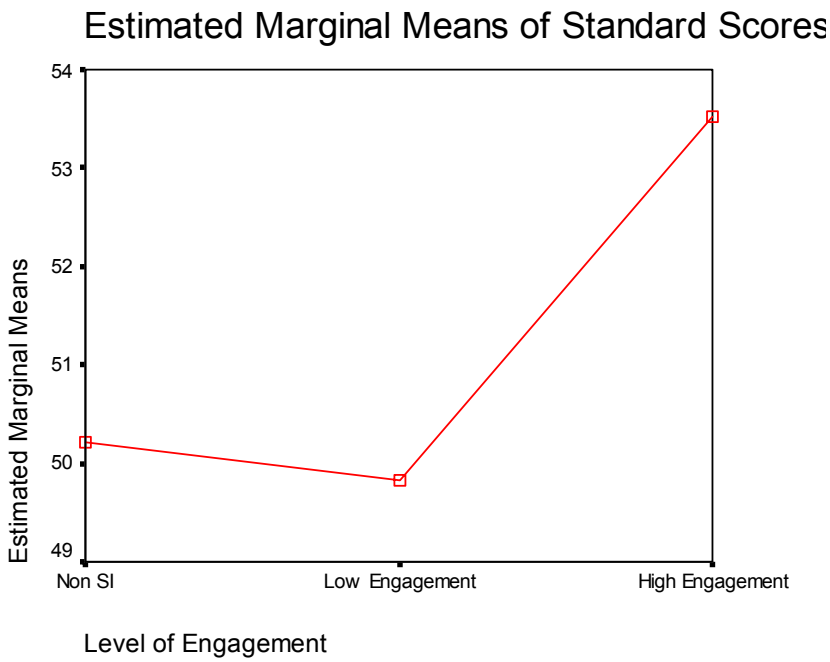

Figure 5. Means Plot of Standard Score by Level of SI Engagement.

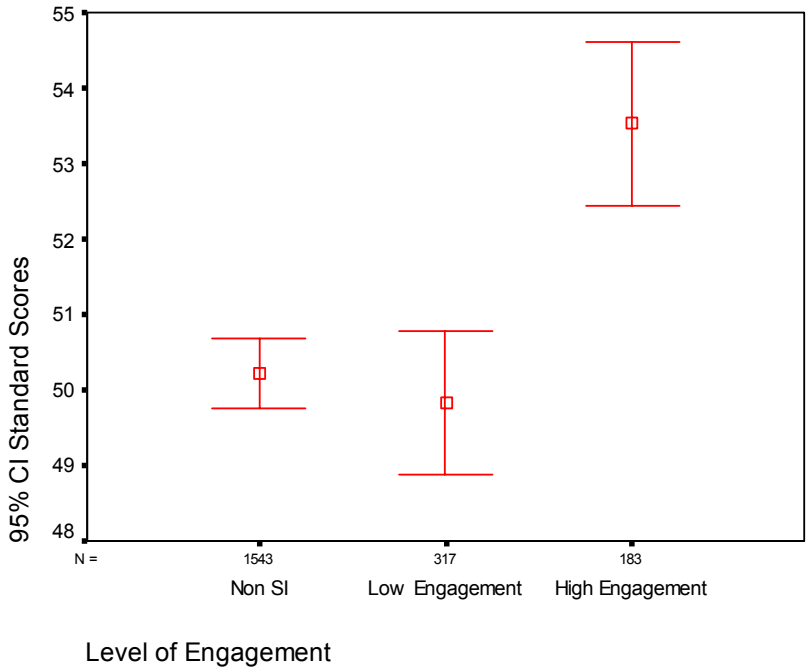

Figure 6. Error Bar Graph of 95% Confidence Intervals for Mean Standard Scores.

The students who were enrolled in one of the History courses were not included in the previous results, because the instructor did not provide numerical final grades to the researcher. For this reason, alternate methodology was employed to analyze the data for that group of students. One way to analyze this data was to run a crosstabulation analysis of the letter grades by levels of SI engagement. Because the cell sizes were rather small, the letter grade data was aggregated into three categories: A, B, and other. The crosstabulation is displayed in Table 92. The statistical significance tests are displayed in Table 93 using the tests for ordinal data. These are analogous to chi-square tests used for nominal data. The pattern differences in the crosstabulation was not statistically significant at an alpha of .05, but they would be statistically significant at an alpha of .10. The actual significance is $p = .051$.

TABLE 92. Crosstabulation: Letter Grade by Level of Engagement

			Level of Engagement			
			Non SI	Low Engagement	High Engagement	Total
Letter Grade Aggregate	A	Count	48	11	14	73
		Expected Count	52.2	9.1	11.7	73.0
	B	Count	29	4	7	40
		Expected Count	28.6	5.0	6.4	40.0
	Other	Count	26	3	2	31
		Expected Count	22.2	3.9	5.0	31.0
Total		Count	103	18	23	144
		Expected Count	103.0	18.0	23.0	144.0

TABLE 93. Directional Measures Significance Tests (Ltr. Grade by Level of Engagement)

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Somers' d	Symmetric	-.137	.069	-1.951	.051
		Letter Grade Aggregate Dependent	-.164	.083	-1.951	.051
		Level of Engagement Dependent	-.118	.060	-1.951	.051

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

In addition to the crosstabulation, the letter grades for the History students were converted to number grades in order to compare the means across the engagement groups. Table 94 displays the estimated marginal means and 95% confidence intervals for the number grade by level of SI engagement. Figure 7 shows the means plot for this data. For this group of students, the highest mean number grades were the students in the low engagement group and the lowest means were for the non SI group. Figure 8 shows the error bars for the 95% confidence intervals. This result indicated that there was less than a 95% probability that the true population means for the SI students was higher than for the non SI group.

TABLE 94. Means Estimates (by Level of Engagement)

Level of Engagement	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Non SI	3.112	.107	2.900	3.324
Low Engagement	3.529	.257	3.021	4.038
High Engagement	3.478	.221	3.041	3.915

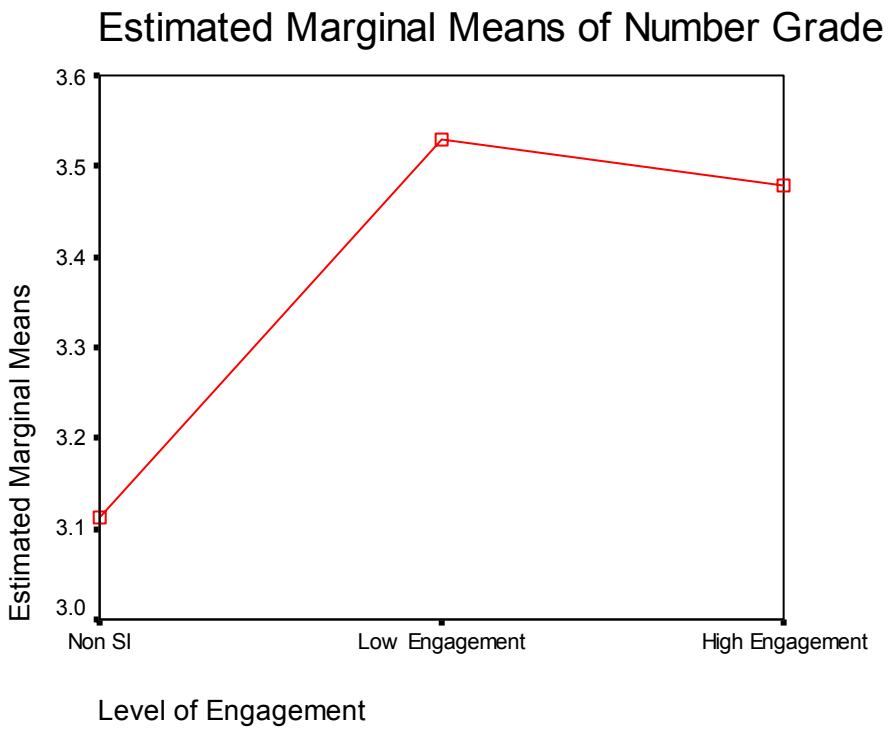

Figure 7. Means Plot of Number Grade by Level of SI Engagement (History 106).

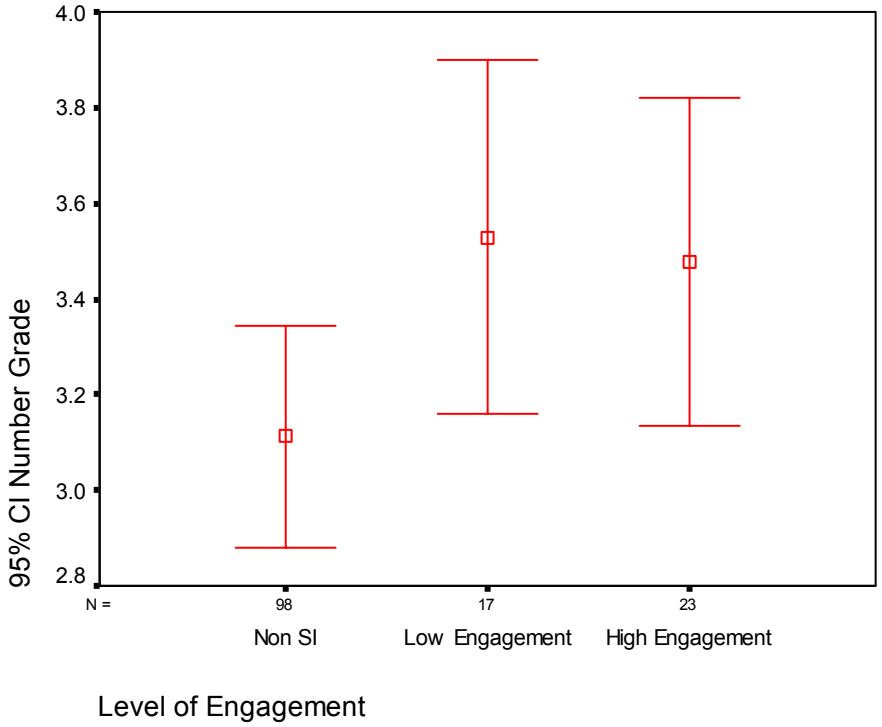

Figure 8. Error bar of 95% Confidence Intervals for Number Grade (History 106).

Relationship between level of SI engagement and persistence

One of the concerns that higher education administrators have is that students satisfactorily complete courses and make progress toward their degree. SI has traditionally focused on what are known as "high-risk courses." High-risk courses have been identified as courses which have a high number of D's, F's, and W's (withdrawals) (Arendale, 1994). Students who earn an A, B, or C in a course are considered to have persisted in the course. Students who earn a D or F along with students who drop the course are considered to have failed to

persist. This section will examine the relationship between SI engagement and course persistence.

The first step in this analysis was to categorize the students in the sample into groups based on their course persistence. For the purposes of this analysis, students who earned an A, B, C, or S (satisfactory) grade were labeled as “successful” and students who earned a D, F, or U (unsatisfactory) grade or who dropped the course were labeled as “unsuccessful”. Table 95 shows the frequencies for the persistence variable by SI course. In the overall sample, 78.8% of the students were successful and 22.2% were unsuccessful. The rate of success varied from a low of 69.8% (CHEM 228) to a high of 90.4% (HIST 106-502).

TABLE 95. Frequencies for Persistence Variable

COURSE		Frequency	Percent
BIOL 113	Unsuccessful	75	27.1
	Successful	202	72.9
	Total	277	100.0
BIOL 114	Unsuccessful	116	21.6
	Successful	421	78.4
	Total	537	100.0
CHEM 102	Unsuccessful	47	19.8
	Successful	190	80.2
	Total	237	100.0
CHEM 228	Unsuccessful	57	30.2
	Successful	132	69.8
	Total	189	100.0
HIST 106-502	Unsuccessful	12	9.6
	Successful	113	90.4
	Total	125	100.0
HIST 106-515	Unsuccessful	23	17.0
	Successful	112	83.0
	Total	135	100.0
HORT 201	Unsuccessful	52	15.7
	Successful	280	84.3
	Total	332	100.0
POLS 206	Unsuccessful	105	22.6
	Successful	360	77.4
	Total	465	100.0
Total	Unsuccessful	487	21.2
	Successful	1810	78.8
	Total	2297	100.0

In order to determine the relationship between persistence and level of SI engagement, crosstabulations were run for the sample. The results of the crosstabulations are displayed in Table 96. Students who were highly engaged

in SI had a success rate of 88.6% compared to 77.6% for non SI students and 79.0% for the low engagement group.

TABLE 96. Crosstabulation: Level of SI Engagement by Persistence Variable

		Level of Engagement			Total
		Non SI	Low	High	
Unsuccessful	Count	389	74	24	487
	Expected Count	367.8	74.6	44.5	487.0
	% within Level	22.4%	21.0%	11.4%	21.2%
Successful	Count	1346	278	186	1810
	Expected Count	1367.2	277.4	165.5	1810.0
	% within Level	77.6%	79.0%	88.6%	78.8%
Total	Count	1735	352	210	2297
	Expected Count	1735.0	352.0	210.0	2297.0
	% within Level	100.0%	100.0%	100.0%	100.0%

Chi-square tests and directional measures of statistical significance based on these crosstabulations are shown in Tables 97 and 98. The chi-square results for pattern differences for these data show a statistically significance difference (x^2 = 13.556; df = 2; p = .001; n= 2297) in persistence by engagement level. Because both of the variables in the table were ordinal in nature, the statistical tests for ordinal data are displayed in Table 98. These results also indicated that there was a significant, positive relationship between level of SI engagement and persistence in the targeted courses.

TABLE 97. Chi-Square Tests:
Persistence by Level of Engagement

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.556(a)	2	.001
Likelihood Ratio	15.360	2	.000
Linear-by-Linear Association	11.144	1	.001
N of Valid Cases	2297		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 44.52.

TABLE 98. Directional Measures Analysis
Persistence by Level of Engagement

			Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Somers' d	Symmetric	.058	.019	3.060	.002
		Persistence Variable Dependent	.053	.017	3.060	.002
		Level of Engagement Dependent	.063	.021	3.060	.002

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

Relationship between level of SI engagement and final course grade controlling for cognitive and motivational factors

In answering research questions two and three, it was shown that students who were highly engaged in SI differed from students who did not attend SI and from students who had a low level of engagement on a number of cognitive and motivational dimensions. On the cognitive measures, it was shown that engagement in SI had a statistically significant correlation with SAT verbal and math scores, but there was not a significant correlation between

cumulative GPR's and SI engagement. Because SAT scores have been shown in a number of studies to have a moderately high correlation with first year grades (Robbins, et al., 2004), it was reasonable to conclude that the relationship between SI engagement and final course grades which was demonstrated in the previous section may have been of even greater magnitude if the analysis was repeated controlling for SAT scores.

For this analysis, standardized final course grade was the dependent variable and level of SI engagement was the independent grouping variable. SAT math and SAT verbal were the covariates. The univariate GLM summary results are shown in Table 99. The effect size for the adjusted model is more than ten times as high (R^2 = .130) as it was in the original model without consideration of the covariates (R^2 = .010), explaining approximately 13% of the total variance.

TABLE 99. Tests of Between-Subjects Effects (Controlling for SAT)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	19304.353(a)	4	4826.088	66.596	.000	.130
Intercept	19837.052	1	19837.052	273.734	.000	.133
MATH	3711.143	1	3711.143	51.211	.000	.028
VERBAL	3271.177	1	3271.177	45.139	.000	.025
ENGLEVEL	2899.188	2	1449.594	20.003	.000	.022
Error	129283.398	1784	72.468			
Total	4753367.372	1789				
Corrected Total	148587.752	1788				

a R Squared = .130 (Adjusted R Squared = .128)

The focus of this analysis was to determine what, if any, effect controlling for the cognitive factors had on the estimated mean standardized final grades. The means estimates for this adjusted model are presented in Table 100. In the adjusted model, the estimated mean standard score for the high engagement group is 54.786 compared to an estimated mean of 50.269 in the non SI group and 50.654 in the low engagement group. Figure 9 graphically illustrate the differences in the estimated marginal means among the three groups of students in the adjusted model. Even controlling for cognitive measures of ability, there was an obvious positive effect for SI engagement.

TABLE 100. Estimated Means of Standard Scores (Controlling for SAT)

			95% Confidence Interval	
Level of Engagement	Mean	Std. Error	Lower Bound	Upper Bound
Non SI	50.269(a)	.233	49.813	50.725
Low Engagement	50.654(a)	.507	49.660	51.648
High Engagement	54.786(a)	.675	53.463	56.110

a Covariates appearing in the model are evaluated at the following values: MATH = 583.73, VERBAL = 562.75.

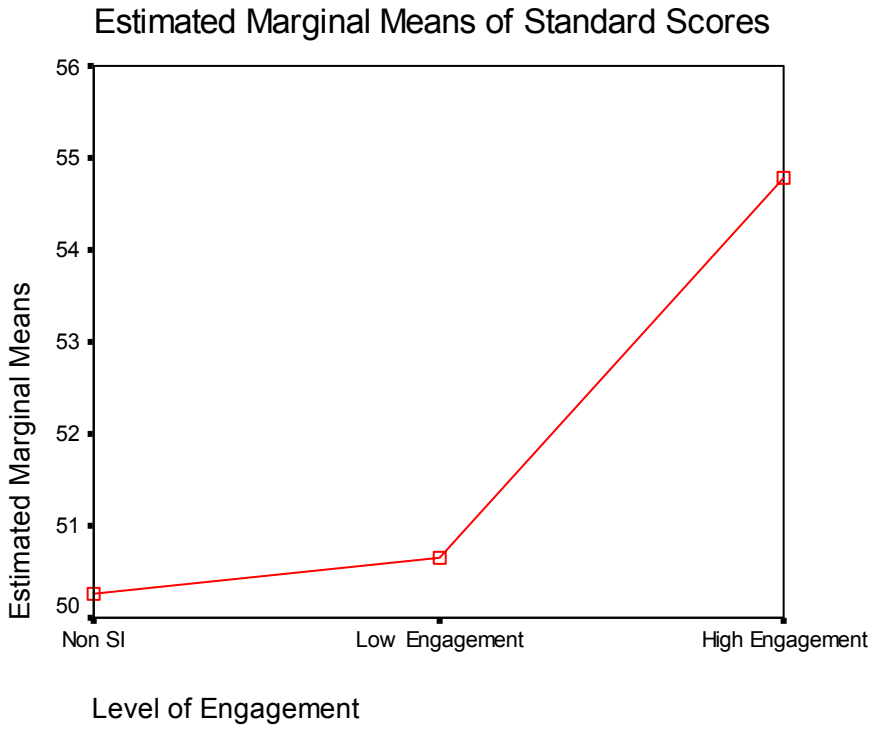

Figure 9. Means Plot for Standard Scores Controlling for SAT Verbal and Math.

The other cognitive factor which has a positive linear relationship with final grades is cumulative GPR. Adding it into the model does attenuate the positive effect of SI engagement slightly. Table 101 shows the GLM univariate results with all three cognitive variables as covariates. The new Adjusted R Squared value for the model is .371, which is considered to be a moderate effect size. Table 102 shows the adjusted marginal means with cumulative GPR added into to the equation. While the new adjusted means do, in fact, attenuate the positive effect of SI engagement, it is still the case that the estimated mean final grade was highest for those students who were highly engaged in SI.

TABLE 101. Tests of Between-Subjects Effects (Controlling for SAT and GPR)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	54477.923(a)	5	10895.585	209.419	.000	.372
Intercept	9824.384	1	9824.384	188.830	.000	.097
MATH	318.575	1	318.575	6.123	.013	.003
VERBAL	1075.136	1	1075.136	20.665	.000	.012
CUMGPR	35569.115	1	35569.115	683.656	.000	.279
ENGLEVEL	1007.509	2	503.754	9.682	.000	.011
Error	91776.968	1764	52.028			
Total	4711091.238	1770				
Corrected Total	146254.891	1769				

a R Squared = .372 (Adjusted R Squared = .371)

TABLE 102. Estimated Means (Controlling for SAT and GPR)

			95% Confidence Interval	
Level of Engagement	Mean	Std. Error	Lower Bound	Upper Bound
Non SI	50.509(a)	.198	50.121	50.898
Low Engagement	50.735(a)	.430	49.891	51.578
High Engagement	53.217(a)	.582	52.076	54.358

a Covariates appearing in the model are evaluated at the following values: MATH = 584.32, VERBAL = 563.32, CumGPRFall = 2892.12.

Another consideration in answering this research question was to determine how motivational factors affected the grade differences among the SI engagement groups. One criticism of SI has been that highly motivated students self select into SI and therefore the grade differences are a result not of the intervention, but of the differences in motivation among the students. The data from this study provided an opportunity to test this theory. The first step

was determining which motivational variables had a linear relationship with standardized final course grades. Hinkle, Wiersma, and Jurs (1998) suggested examination of scatterplots to look for variables which have a linear relationship with the dependent variable. Using this rule of thumb, it was determined that the following motivational variables had linear relationships with standardized final course grade and should be controlled for in the analysis: intrinsic motivation, task value, control beliefs, self-efficacy, and self-regulation.

The GLM univariate results standardized final course grade controlling for motivational factors are displayed in Table 103. The effect size for the motivational model (Adjusted R Squared = .179) is much lower than for the cognitive model, but still explains about 18% of the total variance. The adjusted estimated means are shown in Table 104. The high engagement group had a significantly higher estimated mean than either of the other groups even controlling for motivational factors.

TABLE 103. Tests of Between-Subjects Effects (Controlling for Motivational Variables)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	12045.194(a)	7	1720.742	26.969	.000	.185
Intercept	1171822.102	1	1171822.102	18365.892	.000	.957
INTRINSIC	482.152	1	482.152	7.557	.006	.009
TASK	23.155	1	23.155	.363	.547	.000
CONTROL	1.660	1	1.660	.026	.872	.000
EFFICACY	4827.526	1	4827.526	75.661	.000	.084
SELFREG	229.833	1	229.833	3.602	.058	.004
ENGLEVEL	706.791	2	353.396	5.539	.004	.013
Error	52893.730	829	63.804			
Total	2255811.531	837				
Corrected Total	64938.924	836				

a R Squared = .185 (Adjusted R Squared = .179)

TABLE 104. Estimated Means (Controlling for Motivational Variables)

Level of Engagement	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Non SI	50.926(a)	.325	50.289	51.564
Low Engagement	50.357(a)	.733	48.919	51.795
High Engagement	53.603(a)	.802	52.029	55.176

a Covariates appearing in the model are evaluated at the following values: Intrinsic Motivation = .0116543, Task Value = .0601710, Control Beliefs = .0000364, Self-efficacy = .0313633, Self-regulation = .0356389.

Summary of Findings for Research Question Four

The previous three research questions were designed to provide a better understanding of the factors which relate to academic help-seeking in general and SI engagement in particular. This final question related to the effectiveness of SI. Understanding the characteristics of students who seek academic assistance could be considered a moot issue if the intervention was not

effective. Effectiveness of SI was measured using two criteria: final course grades and persistence.

The first analysis looked at the final grades of students by levels of SI engagement. It was determined based on preliminary data analysis that the final numerical grades should be converted to a standardized metric so that grades could be compared across all eight targeted SI courses for which the grade data were available. The standardized final grades had a mean of 50 and a standard deviation of 10. It was also determined that the presence of outliers in the data set might be problematic and they were removed using a reasonable bounds procedure.

Univariate GLM analysis was run on the data with standardized final course grade as the dependent variable and level of SI participation as the independent variable. The results showed that students classified as high engagement had significantly higher mean final course grades than either non SI participants or students who were classified as low engagement.

The second criterion by which SI effectiveness was measured was course persistence. Students were classified as either successful or unsuccessful based on their final course grade and whether they dropped the course. Students who dropped the course or withdrew from school, along with students who earned D's, F's, or U's, were classified as unsuccessful. Students who earned A's, B's, or C's were classified as successful. Crosstabulation and non-parametric statistical significance tests indicated that there were significant

group differences on the persistence variable. The students labeled as highly engaged in SI had the highest success rate followed by the low engagement group. Students who did not attend SI had the lowest success rate.

Finally, the standardized final grade data was again analyzed controlling for cognitive and motivational variables. In every analysis, the high engagement students had significantly higher mean final course grades than those students who did not attend SI or those who were classified in the low engagement group. The combined results from this research question provide solid evidence for the effectiveness of SI with those students who are classified as highly engaged.

CHAPTER V

SUMMARY AND CONCLUSIONS

The catalyst for this study was curiosity about why some students who are struggling academically will ask for help and seek out support services while others will seemingly suffer in silence. College and university administrators expend tremendous amounts of energy and resources on programs and services designed to assure that every student who is enrolled has a chance to succeed. In spite of these efforts, many students never take advantage of the help that is available.

The literature on help-seeking, which was reviewed in Chapter Two, provided some insights into factors that have been found to be related to help-seeking. Most of this research focused on either demographic variables such as gender and ethnicity or on motivational constructs. In addition, it was noted that the vast majority of research into academic help-seeking has been conducted with primary and secondary students. The previous research on help-seeking in higher education has been almost exclusively survey research and has also primarily focused on help-seeking in the classroom.

The purpose of this study was to determine how cognitive, demographic, and motivational factors could be used to understand help-seeking behavior in college students. Specifically, the study examined engagement in Supplemental Instruction of undergraduate students at Texas A&M University. An additional

purpose of the study was to determine the efficacy of SI. The following research questions were addressed in this study:

1. What is the relationship of the demographic variables with engagement in SI?
2. What is the relationship of the cognitive variables with engagement in SI?
3. What is the relationship of the motivational variables with engagement in SI?
4. What is the relationship of level of SI engagement with success in the targeted courses?

This chapter provides a summary of the methodology used in this study to answer the research questions. There is also a summary of the major findings of the study and some conclusions based on these findings. Finally, there are some recommendations for both future research and some guidance as to how this study may inform future practice in the field of academic support programming.

METHODOLOGY

This study was conducted during the spring semester of 2004 at Texas A&M University. The population of interest for this study consisted of students who were enrolled in courses for which Supplemental Instruction (SI) was available. In order to make statistical inferences based on the data, a random sample of 8 SI courses was drawn from among the 70 targeted courses offered during the semester.

The students enrolled in the randomly selected course sections became the study sample. Data for the study was collected from several sources. SI attendance statistics were provided by the Center for Academic Enhancement. In addition to attendance data, SI leaders in the selected courses assigned a participation rating after every session to each student who attended. A mean participation rating was calculated for each SI participant and this was multiplied by the total number of sessions attended to derive the engagement score for each student who attended SI. Based on this data, students in the sample who never attended SI were labeled as non-SI and those who did attend were labeled as either low or high engagement. These three levels of engagement along with the engagement scores were the focus of much of the data analysis.

Other data for the study came from official university records including gender and ethnicity, SAT scores, classification, major field of study, and grade point ratio. In addition, the instructors for seven of the eight targeted courses provided final numerical grades for their students. A final letter grade was available for the other course section.

The remaining data collected for the study were based on the results of an on-line survey instrument. The survey contained demographic questions about parent education and household income as well as a modified version of the Motivated Strategies for Learning Questionnaire (MSLQ). The resulting data from the survey provided 11 motivational scale scores and 3 demographic variables which were used in the data analysis.

Of the 2,407 students who were enrolled in at least one of the targeted courses, 1,061 students submitted completed and usable surveys for a response rate of 44.1%. The students who were enrolled in multiple course sections were eliminated from the study in order to meet the proper statistical assumptions for the data analysis. The revised sample had 2,297 students, of which 1,003 completed the on-line survey.

Data from the on-line survey was merged with university and departmental data and imported into SPSS, version 11.5 for analysis. Due to the exploratory nature of the study, both univariate and multivariate analyses were conducted. Preliminary data analysis was conducted to determine if there were any significant differences between the survey participants and those who did not submit a survey. There were no differences in the two groups related to ethnicity, classification, major field of study, SAT scores, or previous college grade point averages. However, there was a statistically significant difference in the two groups related to gender. Subsequent analysis showed there was not a significant difference between the genders related to their scores on the motivational scales included in the survey.

The primary focus of the analysis was to determine which variables best predicted the level of SI engagement and to what extent engagement in SI was positively related to success in the targeted courses. Depending on the nature of the variables, parametric or non parametric methods were employed to explore the research questions.

SUMMARY OF FINDINGS

Research question one asked "What is the relationship of the demographic variables with engagement in SI?" In order to answer this question, six separate demographic variables were analyzed: ethnicity, gender, level of family income, parent education, grade level, and college of enrollment. For each variable, analysis was conducted to look at engagement in SI as a continuous variable using univariate General Linear Model (GLM) and SI as a categorical variable using crosstabulations and chi-square analysis.

The results of the GLM analysis showed that there were some small, but statistically significant differences in SI engagement based on the students' ethnicity. Hispanic students had significantly higher levels of engagement than White students, but that there were no other statistically significant differences between other ethnic groups. The ethnic group with the lowest level of engagement in SI was African American students, but the difference was not statistically significant. Crosstabulation of SI engagement groups and ethnicity also indicated significant pattern differences among the groups. Hispanic and Asian students were overrepresented in both the low and high engagement groups, while White students were underrepresented. African American students' pattern of engagement was very close to the expected counts.

Gender was the second demographic variable analyzed. The GLM analysis using SI engagement as the dependent variable showed no significant differences between male and female students. However, chi-square analysis of

SI attendance and gender did indicate a statistically significant difference in the two groups. Female students were more likely to attend SI and had higher overall mean engagement scores than male students.

The third demographic variable of interest was socioeconomic status (SES). For this study, SES was operationalized as level of family income for the students in the sample. The students were divided into six SES groups based on their self-reported level of household income. There were no statistically significant differences in mean SI engagement scores among the SES groups, nor were there shown to be pattern differences among the SES groups with regard to participation in SI.

Level of parent education was also analyzed. As part of the on-line survey, students were asked to indicate the highest level of educational attainment for each of their parents. Neither mother's nor father's level of education was shown to have a statistically significant relationship with SI engagement. There were statistically significant differences among the groups based on the interaction effect of mother and father education. The effect sizes for the differences were very small. Chi-square analysis showed no statistically significant pattern differences among the students based on the crosstabulation of SI attendance and parent education.

The next demographic variable considered was grade level classification. The results of both the GLM analysis and chi-square tests for pattern differences indicated that there were significant differences among the groups based on

their grade level. Post hoc tests showed that the only statistically significant pairwise differences were between freshmen and seniors. The means plot for this variable indicated that the higher the students' grade level, the less likely they were to actively engage in SI.

Finally, the relationship between the students' college affiliation and SI engagement was considered. Univariate GLM analysis indicated that there were no statistically significant differences among the students based on their college. However, chi-square tests showed some significant pattern differences among the groups. Agriculture and engineering students had the lowest levels of engagement, while the students with the highest engagement were enrolled in the College of Education and Human Development. One possible explanation for this finding may be that education students were particularly drawn to the format of SI which emphasizes collaborative learning methods.

Research question two asked "What is the relationship of the cognitive variables with engagement in SI?" To answer this question, two sets of analyses were conducted. First, simple bivariate correlations were computed between SI engagement and the three cognitive variables. These results showed that there was a statistically significant negative correlation between SI engagement and both SAT verbal and SAT math scores. The correlation between SI engagement and cumulative GPR was not statistically significant at the .05 level.

The second set of analyses for this research question involved using multivariate GLM to test the differences in the three cognitive factors as a set of dependent variables with the three levels of SI engagement as the independent variable. A statistically significant overall difference was found among the three SI engagement groups considering the three cognitive variables as a set. In order to explore this overall difference more fully, post hoc analysis of the data was conducted. The post hoc analysis indicated that students who did not participate in SI at all had significantly higher mean SAT verbal and SAT math scores than students who did participate in SI. There were no significant differences in mean SAT math or verbal scores between the two groups of students who did participate in SI.

In analyzing the cumulative GPR variable, the high SI engagement group had a higher estimated mean GPR than either of the other two groups. The low SI engagement group had a lower mean GPR than the students who did not participate in SI, but there was not a statistically significant difference between the two groups.

Research question three asked “What is the relationship of the motivational variables with engagement in SI?” To answer this question, two sets of analyses were conducted. First, simple bivariate correlations were computed between three measures of SI participation and the 11 motivational variables. These results revealed that 7 of the 11 variables had statistically significant correlations with at least one of the measures of SI participation. The

variables were extrinsic motivation, organization, self-efficacy, effort regulation, control beliefs, peer learning, and help-seeking. Of the seven variables, only control beliefs and self-efficacy had negative correlations with the SI participation variables. All of these correlations had rather small effect sizes.

The second set of analyses for this research question involved using multivariate GLM to conduct a MANOVA with the 11 motivational factors as the dependent variables and the three levels of SI engagement as the independent variable. The MANOVA results did indicate a statistically significant overall difference in the three SI engagements groups considering the 11 motivational variables as a set. In order to explore this overall difference more fully, post hoc analysis of the data was conducted using discriminant analysis techniques. The discriminant analysis helped shed some light on the results of the MANOVA by providing some information about an underlying construct which discriminates among the SI engagement groups. This construct has been labeled by this researcher as “academic help-seeking.”

Analysis of the structure matrix revealed six primary motivational factors which were highly correlated with the canonical function. In order of magnitude these factors were help-seeking, peer learning, self-efficacy, control beliefs, extrinsic motivation, and organization. Of these six, all except for self-efficacy and control beliefs had a positive correlation with the discriminant function.

The other information available from the discriminant analysis was the resulting standardized canonical discriminant function coefficients. Like beta

weights in regression analysis, these coefficients are uncorrelated weights for the canonical function. The canonical discriminant function is the mathematical equation based on the set of motivational variables which allows for discrimination among the three SI engagement groups. Based on these results, it was found that self-efficacy, help-seeking, and extrinsic motivation had the highest function coefficients among the variables which had previously been identified as having a significant relationship with academic help-seeking. In addition, it was proposed that intrinsic motivation and task value may have been operating as suppressor variables meaning that taking these two variables into account strengthens the predictive model. The variables which had very little relationship with academic help-seeking in general and SI engagement in particular were view of intelligence and self-regulation.

Research question four asked “What is the relationship of level of SI engagement with success in the targeted courses?” The previous three research questions were designed to provide a better understanding of the factors which relate to academic help-seeking in general and SI engagement in particular. This final question related to the effectiveness of SI. Understanding the characteristics of students who seek academic assistance could be considered a moot issue if the intervention is not effective. Effectiveness of SI was measured using two criteria: final course grades and persistence.

Univariate GLM analysis was conducted on the data with standardized final course grade as the dependent variable and level of SI participation as the

independent variable. The results showed that students classified as high engagement had significantly higher mean final course grades than either non SI participants or students who were classified as low engagement.

The second criterion by which SI effectiveness was measured was course persistence. Students were classified as either successful or unsuccessful based on their final course grade and whether they dropped the course. Students who dropped the course or withdrew from school, along with students who earned D's, F's, or U's, were classified as unsuccessful. Students who earned A's, B's, or C's were classified as successful. Crosstabulation and non-parametric statistical significance tests indicated that there were significant group differences on the persistence variable. The students labeled as highly engaged in SI had the highest success rate followed by the low engagement group. Students who did not attend SI had the lowest success rate.

Finally, the standardized final grade data was again analyzed controlling for cognitive and motivational variables. In every analysis, the high engagement students had significantly higher mean final course grades than those students who did not attend SI or those who were classified in the low engagement group. The combined results from this research question provide solid evidence for the effectiveness of SI with those students who are classified as highly engaged.

CONCLUSIONS

Based on the findings summarized above, several conclusions can be drawn:

1. Minority students in general and Hispanic students in particular were more highly engaged in SI than their White peers. This finding is encouraging because it indicated that SI is reaching a diverse population of students. On a campus with a very large majority of White students, students of color could easily get marginalized in many aspects of campus life including academic support programs. This does not appear to be the case with SI.
2. Female students had higher overall mean SI engagement scores than their male counterparts, but this difference was primarily due to higher numbers of sessions attended. Male students who attended SI received higher mean participation ratings than females. Research reviewed in Chapter II confirmed that females have consistently been found to be more willing to seek help than males. However, based on this study, males who do choose to seek help appear to be slightly more willing to participate actively in the help sessions.
3. Engagement in SI is inversely related to grade level classification. The students with the highest levels of engagement were freshmen, followed by sophomore and juniors. Seniors were the least likely to

engage in SI. There are two possible explanations for this finding. The optimistic view is that as students progress through their college careers, they become more self-regulated in their studies and have less need for outside assistance. A more likely explanation is that the upper level students in this study were not representative of their peers. All of the courses selected for the study and the vast majority of SI courses in general are classified as lower level courses. Juniors and seniors who were enrolled in these courses were probably taking required classes out of sequence and may not have been as highly motivated to engage in outside learning opportunities as their younger peers.

4. Parent's level of education and family income were found to have no significant relationship with SI engagement. The fact that there were no differences on these variables may be a very important finding. Boyd (2004) found in her dissertation study that parent education had a significant relationship with first year retention rates. Low SES has long been identified as a risk factor for student success. It is encouraging that these students who are in these high risk groups were no less likely to engage in SI than their peers.
5. SAT verbal and math scores were inversely related to level of SI engagement. Although the SAT has been a frequent target of critics who believe it is a biased measure and is not a good predictor of

long term success in college, the SAT has been found to be a good predictor of first year college grades (Robbins et al., 2004). The finding that highly engaged SI students had significantly lower SAT scores, but higher final course grades was a positive indicator of the efficacy of SI.

6. There was not a statistically significant correlation between cumulative grade point average and overall SI engagement. However, comparing SI engagement groups, students who were in the high engagement group had significantly higher cumulative GPR's than either of the other groups.
7. There were no significant differences in mean SAT verbal and math scores between the low engagement and high engagement students. The low engagement students had slightly lower SAT math scores and slightly higher SAT verbal scores than the high engagement students. However, there were significant differences in mean GPR's between these two groups. The high engagement students are clearly students who have managed to achieve at a higher level than peers with similar general ability. It is not known how actively any of these students engaged in SI in prior semesters.
8. The motivational variables as a set did have a statistically significant relationship with level of SI engagement. The magnitude of this relationship was rather small.

9. Using discriminant analysis, one underlying construct based on the motivational variables was identified which helps explain the differences in the SI engagement groups. This construct was labeled as “academic help-seeking”. The motivational variables which had the strongest correlations with academic help-seeking were help-seeking, peer learning, self-efficacy, control beliefs, extrinsic motivation, and organization.
10. Two motivational variables, self-efficacy and control beliefs, were negatively correlated with SI engagement. Students who are not confident in their ability to perform well in a course (low self-efficacy) and who perceive that they are not fully in control of their own success (low control beliefs) are more likely to engage in SI than their more confident peers. This finding was particularly interesting in light of previous research concerning self-efficacy. Robbins et al. (2004) noted that higher self-efficacy has generally been found to be a good predictor of high grade point average. In this study, the students who were more engaged in SI had significantly lower self-efficacy, but achieved higher final course grades. This result also contradicted previous studies which found high self-efficacy was positively related to help-seeking behavior (Newman, 1991; Ryan, Gheen, & Midgley, 1998).

11. Task value and intrinsic motivation were identified as possible suppressor variables. This finding suggests that while these variables do not have a strong relationship to help-seeking, they do have a strong relationship with other motivational variables and including these variables in a predictive model will improve the predictive power of the model.
12. Students who were labeled as highly engaged in SI had significantly higher mean standardized final grades in the targeted courses than either the students who did not attend SI or the students who were labeled as low engagement. There was no significant difference in final grades between the non-SI and low engagement groups. This finding suggests that SI is an effective intervention, but that it requires students to actively participate throughout the semester.
13. Students who were labeled as highly engaged in SI were significantly more likely to successfully complete the targeted courses than either the students who did not attend SI or the students who were labeled as low engagement. There was no significant difference in persistence between the non-SI and low engagement groups. This finding also supports the efficacy of SI for students who actively participate throughout the semester.
14. When SAT verbal and math scores were entered as covariates in the analysis, the positive difference in estimated mean final grades

between the high engagement group and the non-SI group was even greater than it was without controlling for these factors. This result provides additional support for the conclusion that the positive effect of SI may often be underestimated.

15. When cumulative GPR was added to SAT verbal and math scores as an additional covariate, the positive effect of SI engagement was slightly attenuated, but still remained statistically significant. This model which included the three cognitive variables and SI engagement explained about 37% of the total variance in standard scores (Adjusted R^2 = .371).
16. When intrinsic motivation, task value, control beliefs, self-efficacy, and self-regulation were entered as covariates, the positive effect of SI engagement was slightly attenuated, but still remained statistically significant. This model which included the three cognitive variables and SI engagement explained about 18% of the total variance in standard scores (Adjusted R^2 = .179).

RECOMMENDATIONS FOR ACADEMIC SUPPORT PROGRAMS

This study has some practical applications for academic support programs that may serve to improve services and ultimately help students succeed. The following recommendations are intended to assist administrators of academic support services:

1. It is apparent from this study that marginal engagement in SI is not effective. Effort should be made early in the semester to identify students who have attended only one or two sessions who may need extra encouragement to become more fully engaged in SI.
2. While SI has been shown to be effective, the magnitude of the effect is small. Existing SI programs should carefully assess their program and seek to make improvements in training and supervision of SI leaders to maximize this positive effect.
3. Academic support programs often have courses or workshops which provide information to primarily first year students about improving study skills and understanding motivation. Strategic help-seeking in the context of self-regulated learning should a component of these workshops or courses. Previous studies have demonstrated that study skills and motivational strategies can be changed through educational interventions (Dweck, 1999; Ryan, Gheen, & Midgley, 1998).
4. Despite its proven effectiveness, a large percentage of students never attend SI sessions. Administrators of SI programs should implement strategies to improve overall participation rates.
5. Using the results from this study, study skills instructors or academic advisors may want to identify students who are least likely to engage in SI and either target marketing efforts toward these

students or identify other interventions which may be effective in helping these students achieve success.

6. SI has been shown to be particularly effective with high-risk students and this study demonstrated that high-risk students are slightly more likely to actively engage in SI than their peers. Institutions which do not have SI should consider implementing this program to assist their high-risk students.

RESEARCH RECOMMENDATIONS

While this study addressed four major research questions related to understanding academic help-seeking and SI efficacy, further research needs to be conducted to answer additional questions in this line of inquiry.

1. In this study, SI engagement was the operational definition of help-seeking, but there was no attempt to distinguish types of help seeking. Sharon Nelson-Le Gall (1981) and others (Karabenick, 1998; Newman, 1998) have noted that help-seeking can be either executive or instrumental depending on the nature of the help that is sought. Future research into this topic should make an attempt to distinguish between these types of help-seeking.
2. Because of the complexity in defining and measuring student motivation, this study should be replicated using different measures of motivation in order to better define which aspects of motivation

are most closely related to help-seeking in general and SI engagement in particular.

3. The engagement measure developed for this study could be refined and improved for future studies. One suggestion would be to have someone other than the SI leader trained to rate participation. This would likely reduce measurement error and improve the accuracy of the results.
4. Future research into SI efficacy should utilize better measures to determine the students' pre-condition. A pre-test of prerequisite skills for targeted courses would better isolate the positive effect of SI than global measures such as SAT scores or high school achievement.
5. Future research into SI engagement and efficacy should take leader characteristics into account. It is not clear from this present study whether SI attendance and participation or the measures of efficacy may be affected by characteristics of the SI leaders themselves. These characteristics could be semesters of experience, gender, ethnicity, content knowledge of the leader, facilitation skills, or other characteristics which may impact both the efficacy of SI and the willingness of students to actively engage in SI sessions.
6. SI was not the only possible source of help available to the students enrolled in the targeted courses. For several of the targeted

courses there are off campus private help sessions available. In addition, the students have access to direct help from professors and teaching assistants. Many students have access to private tutors or informal tutoring from friends or roommates. Future studies should attempt to measure utilization of these other sources of help in addition to SI in order to better understand help-seeking processes. This line of inquiry would also provide some comparison data as to the effectiveness of SI compared to other sources of help.

7. As was the case with the sample for this study, it is not uncommon for students to be enrolled in multiple course sections for which SI is available. In order to meet statistical assumptions, these students were eliminated from the study. Future studies should be designed to examine the effects of having multiple SI classes on measures such as engagement and final course grades.
8. Future studies should look at longer term effects of SI such as persistence in multiple semesters, success in subsequent courses, or graduation rates.
9. This study revealed some differences in help-seeking based on students' grade level. Because the courses selected for this study were lower level classes, the upper level students enrolled in these classes may not have been representative of typical upper level

students. Future research should examine help-seeking in upper level students enrolled in upper level classes.

10. Future research should attempt to distinguish what aspects of SI have the greatest positive effect on student outcomes. While the quantitative methodology employed for this study was useful and appropriate due to the exploratory nature of the research questions, there is much that could be learned about SI effectiveness and academic help-seeking by using naturalistic inquiry methods. These methods would allow researchers to understand in much more depth what motivates students to seek help and what aspects of SI contribute most to student success. The thick description which is embedded in naturalistic inquiry methodology would add much to understanding the complexities of academic help-seeking.

FINAL THOUGHTS

For the foreseeable future, colleges and universities will continue to recruit and admit students who may not be fully prepared for college. It is important that programs such as Supplemental Instruction are available to help such students succeed academically. This study provides compelling evidence that for such interventions to have their maximum effect, students must fully engage in the process. It is encouraging that “at risk” students were more likely to be highly engaged in SI than their better prepared peers.

Because of the large sample for this study, it is reasonable to conclude that these results can be generalized to all undergraduate students at this university and to undergraduate populations at other similar universities. It is the hope of this author that these findings will encourage universities with existing SI programs to continue to support them and for institutions seeking new ways to provide academic assistance programs to consider implementing the SI model. In addition, it is hoped that this study will help those who provide academic assistance programs better understand which students may be most likely to take advantage of those programs and which students may need additional encourage to seek out help.

REFERENCES

Addis, M.E., & Mahalik, J.R. (2003). Men, masculinity, the contexts of help seeking. *American Psychologist, 58,* 5-14.

Alexitch, L.R. (1997). Students' educational orientation and preferences for advising from university professors. *Journal of College Student Development, 38,* 333-343.

Alexitch, L.R. (2002). The role of help-seeking attitudes and tendencies in students' preferences for academic advising. *Journal of College Student Development, 43,* 5-19.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivational processes. *Journal of Educational Psychology, 80,* 260-267.

Ames, R. (1983). Help-seeking and achievement orientation: Perspectives from attribution theory. In B.M. DePaulo, A. Nadler, & J.D. Fisher (Eds.), *New directions in helping: Vol. 2. Help-seeking.* (pp. 165-186). New York: Academic Press.

Ames, R., & Lau, S. (1982). An attributional analysis of help-seeking in academic settings. *Journal of Educational Psychology , 74,* 414-423.

Andrews, G. R., & Debus, R. L. (1978). Persistence and the causal perception of failure: Modifying cognitive attributions. *Journal of Educational Psychology, 70,* 154-166.

Arbreton, A. (1998). Student goal orientation and help-seeking strategy use. In S.A. Karabenick, (Ed.), *Strategic help seeking: Implications for learning and teaching.* Mahway, NJ: Lawrence Erlbaum Associates.

Arendale, D. (1994). Understanding the Supplemental Instruction model. In D.C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention* (pp. 11-22). San Francisco: Jossey-Bass.

Asser, E.S. (1978). Social class and help seeking behavior. *American Journal of Community Psychology, 6,* 465-474.

Bembenutty, H. (2002). *Self-regulation of learning and academic delay of gratification: Individual differences among college students.* Paper presented at the Annual Meeting of the American Research Association. (ERIC Document Reproduction Service No. ED468704)

Bembenutty, H., & Karabenick, S.A. (1997). *Academic delay of gratification in conditionally-admissible minority college students.* Paper presented at the Annual Meeting of the American Research Association. (ERIC Document Reproduction Service No. ED411721)

Blanc, R.A., DeBuhr, L., & Martin, D.C. (1983). Breaking the attrition cycle: The effects of Supplemental Instruction on undergraduate performance and attrition. *Journal of Higher Education, 54,* 80-89.

Boyd, K.H. (2004). An analysis of selected pre- and post-admission variables as they relate to the retention of new freshmen at a large, research, public university. *Dissertations Abstracts International, 65* (05), 1686A. (UMI No. 3132072)

Boylan, H. (1999a). Exploring alternatives to remediation. *Journal of Developmental Education, 22*(3), 2-8.

Boylan, H. (1999b). Harvard Symposium 2000: Developmental education: Demographics, outcomes, and activities. *Journal of Developmental Education, 23*(2), 2-4, 6, 8.

Bray, J.H., & Maxwell, S.E. (1985). Multivariate analysis of variance. *Sage University Paper series on Quantitative Applications in the Social Sciences* (Series No. 07-054). Newbury Park, CA: Sage.

Brownlow, S., & Reasinger, R.D. (2000). Putting off until tomorrow what is better done today: Academic procrastination as a function of motivation toward college work. *Journal of Social Behavior and Personality, 15,* 15-34.

Butler, D. L. (1998). The strategic content learning approach to promoting self-regulated learning: A report of three studies. *Journal of Educational Psychology, 90,* 682-697.

Butler, R. (1993). Effects of task-achievement and ego-achievement goals on information-seeking during task engagement. *Journal of Personality and Social Psychology, 65,* 18-31.

Butler, R. (1998). Determinants of help seeking: Relations between perceived reasons for classroom help-avoidance and help-seeking behaviors in an experimental context. *Journal of Educational Psychology, 90,* 630-643.

Butler, R., & Neuman, O. (1995). Efffects of task and ego achievement goals on help-seeking behaviors and attitudes. *Journal of Educational Psychology, 87,* 261-271.

Center for Academic Enhancement (2004). *Historical summary data for Supplemental Instruction Program at Texas A&M University: 1993 to 2004.* Texas A&M University.

Center for Supplemental Instruction. (2000). *Supplemental Instruction: Review of research concerning the effectiveness of SI from The University of Missouri-Kansas City and other institutions from across the United States.* University of Missouri-Kansas City, Author, Center for Academic Development.

Congos, D. (1998). Inside Supplemental Instruction sessions: One model of what happens that improves grades and retention. *Research and Teaching in Developmental Education, 15,* (1), 47-62.

Congos, D. (2002). How Supplemental Instruction stacks up against Chickering's 7 Principles for Good Practice in Undergraduate Education. *Research and Teaching in Developmental Education, 19* (1)*,* 75-83.

Congos, D. (2003). Is SI's help helpful? *Research and Teaching in Developmental Education, 19* (2)*,* 79-90.

Congos, D., & Schoeps, N. (1993). Does supplemental instruction really work and what is SI anyway? *Studies in Higher Education, 18,* 165-176.

Courville, T., & Thompson, B. (2001). Use of structure coefficients in published multiple regression articles: β is not enough. *Educational and Psychological Measurement, 61,* 229-248.

Covington, M.V., & Mueller, K.J. (2001). Intrinsic versus extrinsic motivation: An approach/avoidance reformulation. *Educational Psychology Review, 13,* 157-176.

Cutright, M. (2002). What are research universities doing for first-year students? *About Campus, 7(4),* 16-20.

DeNavas-Walt, C., Cleveland, R., & Webster, B.H. (2003). *Income in the United States: 2002.* (U.S. Census Bureau, Current Population Reports, P60-221). Washington, DC: U.S. Government Printing Office.

DePaulo, B.M. (1983). Perspectives on help-seeking. In B.M. DePaulo, A. Nadler, & J.D. Fisher (Eds.), *New directions in helping: Vol. 2. Help-seeking.* (pp. 3-12). New York: Academic Press.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development.* Philadelphia: Psychology Press.

Dweck, C.S., Hong, Y., & Chiu, C. (1993). Implicit theories: Individual differences in the likelihood and meaning of dispositional inference. *Personality and Social Personality and Social Psychology Bulletin, 19,* 644 - 656.

Eisenberg, N. (1983). Developmental aspects of recipients' reactions to aid. In J.D. Fisher, A. Nadler, & B.M. DePaulo, (Eds.), *New directions in helping: Vol. 1. Recipient reactions to aid.* (pp. 189-222). New York: Academic Press.

Fischer, E.H., Winer, D., & Abramowitz (1983). Seeking professional help for psychological problems. In A. Nadler, J.D. Fisher, & B.M. DePaulo, (Eds.), *New directions in helping: Vol. 3. Applied perspectives on help-seeking and -receiving.* (pp. 3-18). New York: Academic Press.

Fish, L.J. (1988). Why multivariate methods are usually vital. *Measurement and Evaluation in Counseling and Development, 21,* 130-137.

Fisher, J.D., Nadler, A., & Whitcher-Alagna, S. (1983). Four theoretical approaches for conceptualizing reactions to aid. In J.D. Fisher, A. Nadler, & B.M. DePaulo, (Eds.), *New directions in helping: Vol. 1. Recipient reactions to aid.* (pp. 51-84). New York: Academic Press.

Friedlander, J. (1980). Are college support programs and services reaching high-risk students? *Journal of College Student Personnel*, *21,* 23-28.

Gattis, K.W. (2002). Responding to self-selection bias in assessments of academic support programs: A motivational control study of Supplemental Instruction. *The Learning Assistance Review, 7,* 26-37.

George, C. A. (2001). Evaluating assumptions of multivariate normality. Paper presented at the Annual Meeting of the Southwest Educational Research Association. (ERIC Document Reproduction Service No. ED450155).

Gloria, A. M., Hird, J. S., & Navarro, R. L. (2001). Relationships of cultural congruity and perceptions of the university environment to help-seeking attitudes by sociorace and gender. *Journal of College Student Development, 42,* 545-562.

Gross, A.E., & McMullen, P.A. (1983). Models of the help-seeking process. In B.M. DePaulo, A. Nadler, & J.D. Fisher (Eds.), *New directions in helping: Vol. 2. Help-seeking.* (pp. 45-70). New York: Academic Press.

Hinkle, D.E., Wiersma, W., & Jurs, S.G. (1998). *Applied statistics for the behavioral sciences* (4th ed.). Boston: Houghton Mifflin Company.

Hodges, R., & White, W. G. (2001). Encouraging high-risk student participation in tutoring and Supplemental Instruction. *Journal of Developmental Education, 24* (3), 2-10.

Hofer, B. K., Yu, S. L., & Pintrich, P. R. (1998). Teaching college students to be self-regulated learners. In D.H. Schunk & B.J. Zimmerman (Eds.), *Self-regulated learning: From teaching to self-reflective practice,* (pp. 57-85). New York: Guilford Press.

Hong, Y., Chiu, C., Dweck, C.S., Lin, D.M., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology, 77,* 588-599.

Hoyt, J.E., & Sorensen, C.T. (2001). High school preparation, placement testing, and college remediation. *Journal of Developmental Education, 25* (2), 26-28, 30, 32-34.

Huberty, C.J. (1994). *Applied discriminant analysis.* New York: Wiley and Sons.

Huberty, C.J., & Wisenbaker, J. (1992). Discriminant analysis: Potential improvements in typical practice. In B. Thompson (Ed.), *Advances in social science methodology* (Vol. 2, pp. 169-208). Greenwich, CT: JAI Press.

Karabenick, S.A. (1998). Help-seeking as a strategic resource. In S.A. Karabenick, (Ed.), *Strategic help seeking: Implications for learning and teaching.* Mahway, NJ: Lawrence Erlbaum Associates.

Karabenick, S.A. (2003). Seeking help in large college classes: A person-centered approach. *Contemporary Educational Psychology*, *28*, 37-58.

Karabenick, S.A., & Knapp, J.R. (1991). Relationship of academic help-seeking to the use of learning strategies and other instrumental achievement behavior in college students. *Journal of Educational Psychology, 83,* 221-230.

Kenney, P.A., & Kallison, J.M. (1994). Research studies on the effectiveness of Supplemental Instruction in mathematics. In D.C. Martin, & D. Arendale (Eds.), *Supplemental Instruction: Increasing achievement and retention,* (pp. 75-82). San Francisco: Jossey-Bass.

Kitsantas, A. (2002). Test preparation and performance: A self-regulatory analysis. *The Journal of Experimental Education, 70,* 101-113.

Klecka, W.R. (1980). Discriminant analysis. *Sage University Paper series on Quantitative Applications in the Social Sciences* (Series No. 07-019). Newbury Park, CA: Sage.

Knapp, J.R., & Karabenick, S.A. (1988). Incidence of formal and informal academic help-seeking in higher education. *Journal of College Student Development, 29,* 223-227.

Light, R.J. (2001). *Making the most of college: Students speak their minds.* Cambridge, MA: Harvard University Press.

Magnusson, J.L. & Perry, R.P. (1992). Academic help-seeking in the university setting: The effects of motivational set, attributional style, and help source characteristics. *Research in Higher Education, 33,* 227-245.

Martin, D.C., & Arendale, D. (1993). Foundation and theoretical framework for Supplemental Instruction. In D.C. Martin & D. Arendale (Eds.), *Supplemental Instruction: Improving first-year student success in high-risk courses* (2nd ed.), (pp. 41-50). Columbia, S.C.: National Resource Center for the Freshman Year Experience and Students in Transition. (ERIC Document Reproduction Service, No. ED 345 839).

Martin, D.C. & Blanc, R.A. (1981). The learning center's role in retention: Integrating student support services with departmental instruction. *Journal of Developmental and Remedial Education, 4,* (3)*,* 2-4 & 21-23.

Martin, E.E. (2002). Help seeking: An analysis of how religious commitment, gender, race, and socioeconomic status relate to help seeking attitudes and behavior. *Dissertation Abstracts International, 63* (06), 3015B. (UMI No. 3057092)

McGee, J. (1998, March). *The effectiveness of Supplemental Instruction with provisionally admitted college students.* Paper presented at the annual meeting of the National Association of Developmental Education, Atlanta, GA.

McGee, J. (2003, February). *A comparison of linear versus quadratic rules in discriminant analysis.* Paper presented at the annual meeting of the Southwestern Educational Research Association, San Antonio, TX.

McKeachie, W. J., Pintrich, P. R., & Lin, Y. G. (1985). Teaching learning strategies. *Educational Psychologist, 20*, 153-160.

Moak, C. E. (2002). The psychometric properties of the Learning and Study Strategies Inventory. *Dissertations Abstracts International, 63* (04), 1256A. (UMI No. 3049998)

Nadler, A. (1983). Social psychology and social issues: Research and theory on help-seeking and -receiving in applied settings. In A. Nadler, J.D. Fisher, & B.M. DePaulo, (Eds.), *New directions in helping: Vol. 3. Applied perspectives on help-seeking and -receiving.* (pp. 3-18). New York: Academic Press.

Nadler, A. (1991). Help-seeking behavior: Psychological costs and instrumental benefits. In M.S. Clark (Ed.), *Review of personality and social psychology: Vol. 12. Prosocial behavior* (pp. 290-311). Newberry Park: Sage.

Nadler, A. & Mayseless, O. (1983). Recipient self-esteem and reactions to help. In J.D. Fisher, A. Nadler, & B.M. DePaulo, (Eds.), *New directions in helping: Vol. 1. Recipient reactions to aid.* (pp. 167-188). New York: Academic Press.

Nelson-Le Gall, S. (1981). Help-seeking: An understudied problem-solving skill in children. *Developmental Review, 1,* 224-246.

Nelson-Le Gall, S. & Resnick, L. (1998) Help seeking, achievement motivation, and the social practice of intelligence in school. In S.A. Karabenick, (Ed.), *Strategic help seeking: Implications for learning and teaching.* Mahway, NJ: Lawrence Erlbaum Associates.

Newman, R. S. (1991). Goals and self-regulated learning: What motivates children to seek academic help? In M. L. Maehr, & P. R. Pintrich, (Eds.), *Advances in motivation and achievement: A research annual* (Vol. 7, pp. 151-183). Greenwich, CT: JAI Press.

Newman, R.S. (1998). Adaptive help seeking: A role of social interaction in self-regulated learning. In S.A. Karabenick, (Ed.), *Strategic help seeking: Implications for learning and teaching.* Mahway, NJ: Lawrence Erlbaum Associates.

Nolen, S.B. (1988). Reasons for studying: Motivational orientations and study strategies. *Cognition and Instruction, 5,* 269-287.

Nolen, S.B. (1996). Why study? How reasons for learning influence strategy selection. *Educational Psychology Review, 8,* 335-355.

Office of Institutional Studies and Planning (2004). *Statistical Factbook.* Texas A&M University. Retrieved January 11, 2005, from http://www.tamu.edu/oisp/factbook /Index.htm

Ogden, P., Thompson, D., Russell, A., & Simons, C. (2003). Supplemental Instruction: Short and long-term impact. *Journal of Developmental Education, 26,* 2-8.

Pintrich, P.R., & Garcia, T. (1994). Self-regulated learning in college students: Knowledge, strategies, and motivation. In P.R. Pintrich, D.R. Brown, & C.E. Weinstein (Eds.) *Student motivation, cognition, and learning: Essays in honor of Wilbert J. McKeachie.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Pintrich, P.R., Smith, D.A, Garcia, T., & McKeachie, W.J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)* (Technical Report No. 91-B-004). Ann Arbor: The Regents of The University of Michigan.

Pintrich, P.R., Smith, D.A, Garcia, T., & McKeachie, W.J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53,* 801-813.

Robbins, S.B, Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychological and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin, 130,* 261-288.

Rosen, S. (1983). Perceived inadequacy and help-seeking. In B.M. DePaulo, A. Nadler, & J.D. Fisher (Eds.), *New directions in helping: Vol. 2. Help-seeking.* (pp. 73-107). New York: Academic Press.

Ryan, A. M., Gheen, M. H., & Midgley, C. (1998). Why do some students avoid asking for help? An examination of the interplay among students' academic efficacy, teachers' social-emotional role, and the classroom goal structure. *Journal of Educational Psychology, 90,* 528-535.

Schneider, C.G. (2003). Preparing students for what? School-college alignment in an era of greater expectations. *Peer Review, 5,* 13-16.

Schunk, D. H. (2000). *Learning theories: An educational perspective* (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.

Shapiro, E. G. (1983). Embarrassment and help-seeking. In B.M. DePaulo, A. Nadler, & J.D. Fisher (Eds.), *New directions in helping: Vol. 2. Help-seeking.* (pp. 143-163). New York: Academic Press.

Sheu, H. & Sedlacek, W.E. (2002). *Help-seeking attitudes and coping strategies among college students by race.* Paper presented at the Annual Conference of the American Psychological Association. (ERIC Document Reproduction Service No. ED472957)

Shwalb, D.W., & Sukemune, S. (1998). Help seeking in the Japanese college classroom: Cultural, developmental, and social-psychological influences. In S.A. Karabenick, (Ed.), *Strategic help seeking: Implications for learning and teaching.* Mahway, NJ: Lawrence Erlbaum Associates.

Stansbury, S. (2001). Accelerated learning groups enhance Supplemental Instruction for at-risk students. *Journal of Developmental Education, 24* (3)*,* 20-28.

Stevens, J.P. (2002). *Applied multivariate statistics for the social sciences* (4th ed.). Mahwah, N.J.: Lawrence Erlbaum Associates.

Stipek, D. (2002). *Motivation to learn: Integrating theory and practice* (4th ed.). Boston: Allyn and Bacon.

Texas Higher Education Coordinating Board. (2000). *Closing the gaps: Texas higher education plan.* Austin: Author.

Thompson, B. (1990). Multinor: A Fortan program that assists in evaluating multivariate normality. *Educational and Psychological Measurement, 50,* 845-848.

Thompson, B. (1992). *Interpreting regression results: beta weights and structure coefficients are both important.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco. (ERIC Document Reproduction Service No. ED344897).

Thompson, B. (1994). *Why multivariate methods are usually vital in research: Some basis concepts.* Paper presented as a Featured Speaker at the biennial meeting of the Southwestern Society for Research in Human Development, Austin, TX. (ERIC Document Reproduction Service No. ED367687)

Thompson, B. (1996). Problems with multivariate normality: Can the multivariate bootstrap help? Paper presented at the Annual Meeting of the Society for Applied Multivariate Research. (ERIC Document Reproduction Service No. ED398248)

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92,* 548-573.

Widmar, G.E. (1994). Supplemental Instruction: From small beginnings to a national program. *New Directions for Teaching and Learning, 60,* 3-10.

Zimmerman, B.J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist, 33 (2-3),* 73-86.

Zimmerman, B. J. (2001). Theories of self-regulated learning and academic achievement: An overview and analysis. In B. J. Zimmerman & D.H. Schunk, (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives.* Malway, NJ: Lawrence Erlbaum Associates.

APPENDIX A

ON-LINE SURVEY INSTRUMENT

Texas A&M University Department of Educational Administration

SUPPLEMENTAL INSTRUCTION MOTIVATION QUESTIONNAIRE

Please take a few minutes to answer the following questions. These data will be kept confidential. They will be used as part of a research study involving motivation for attending Supplemental Instruction (SI). There will be no other use of the data. Thank you for your time.

To ensure that your data is submitted properly, it is recommended that you use **Internet Explorer** as your browser.

Make sure you include your name. Once we have verified your participation, your name will be removed from the database; only the answers to these questions will remain.

Name _____ First name Last name - upper and lower case. For example, Joan Smith

Part A. DEMOGRAPHICS

1. What is your father's highest level of education?
   Click arrow to view choices
2. What is your mother's highest level of education?
   Click arrow to view choices
3. What is the estimated annual income of your parents?
   Click arrow to view choices
4. Indicate which SI course you are enrolled in.
   Click arrow to view choices

Part B. UNDERSTANDING OF INTELLIGENCE SURVEY

Using the scale below, please indicate the extent to which you agree or disagree with each of the following statements.

Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree
1	2	3	4	5	6
☐	☐	☐	☐	☐	☐

5. You have a certain amount of intelligence, and you can't really do much to change it.
6. Your intelligence is something about you that you can't change very much.
7. No matter who you are, you can significantly change your intelligence level.
8. To be honest, you can't really change how intelligent you are.
9. No matter how much intelligence you have, you can always change it quite a bit.

Part C. MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE *

The following questions ask about your motivation for and attitudes about your class. Please think about the class you entered in question 4 when answering these questions. Remember there are no right or wrong answers, just answer as accurately as possible. Use the scale below to answer the questions. If you think the statement is very true of you, click 7; if a statement is not at all true of you, click 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

* Questions in part C reprinted with permission from Pintrich, et al., (1991).

10. In a class like this, I prefer course material that really challenges me so I can learn new things.
11. If I study in appropriate ways, then I will be able to learn the material in this course.
12. I think I will be able to use what I learn in this course in other courses.
13. I believe I will receive an excellent grade in this class.
14. I'm certain I can understand the most difficult material presented in the readings for this course.
15. Getting a good grade in this class is the most satisfying thing for me right now.
16. It is my own fault if I don't learn the material in this course.
17. It is important for me to learn the course material in this class.
18. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
19. I'm confident I can learn the basic concepts taught in this course.
20. If I can, I want to get better grades in this class than most of the other students.
21. I'm confident I can understand the most complex material presented by the instructor in this course.
22. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
23. I am very interested in the content area of this course.
24. If I try hard enough, then I will understand the course material.
25. I'm confident I can do an excellent job on the assignments and tests in this course.
26. I expect to do well in this class.
27. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
28. I think the course material in this class is useful for me to learn.
29. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.
30. If I don't understand the course material, it is because I didn't try hard enough.

31. I like the subject matter of this course.
32. Understanding the subject matter of this course is very important to me.
33. I'm certain I can master the skills being taught in this class.
34. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.
35. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.
36. When I study the readings for this course, I outline the material to help me organize my thoughts.
37. During class time I often miss important points because I'm thinking of other things.
38. When studying for this course, I often try to explain the material to a classmate or friend.
39. When reading for this course, I make up questions to help focus my reading.
40. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do.
41. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone.
42. When I become confused about something I'm reading for this class, I go back and try to figure it out.
43. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
44. If course readings are difficult to understand, I change the way I read the material.
45. I try to work with other students from this class to complete the course assignments.
46. I work hard to do well in this class even if I don't like what we are doing.
47. I make simple charts, diagrams, or tables to help me organize course material.
48. When studying for this course, I often set aside time to discuss course material with a group of students from the class.
49. Before I study new course material thoroughly, I often skim it to see how it is organized.

50. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
51. I often find that I have been reading for this class but don't know what it was all about.
52. I ask the instructor to clarify concepts I don't understand well.
53. When course work is difficult, I either give up or only study the easy parts.
54. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
55. When I study for this course, I go over my class notes and make an outline of important concepts.
56. When I can't understand the material in this course, I ask another student in this class for help.
57. Even when course materials are dull and uninteresting, I manage to keep working until I finish.
58. I try to identify students in this class whom I can ask for help if necessary.
59. When studying for this course I try to determine which concepts I don't understand well.
60. When I study for this class, I set goals for myself in order to direct my activities in each study period.
61. If I get confused taking notes in class, I make sure I sort it out afterwards.

Thank you for your participation.

Submit Reset

For questions relating to this survey please contact:

Joel McGee at (979) 458-0700 or jmcgee@tamu.edu
Blocker Rm. 525, Center for Academic EnhancementMS 4230
Texas A&M University.

APPENDIX B

SELECTED MSLQ ITEMS AND SCALES

SELECTED MSLQ ITEMS AND SCALES

Items used for each scale of the Supplemental Instruction Motivation Questionnaire (Adapted from the *Motivated Strategies for Learning Questionnaire*.*)

Note numbers correspond with on-line survey item numbers.

Intrinsic Goal Orientation:

10. In a class like this, I prefer course material that really challenges me so I can learn new things.
22. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
27. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
29. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

Extrinsic Goal Orientation:

15. Getting a good grade in this class is the most satisfying thing for me right now.
18. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
20. If I can, I want to get better grades in this class than most of the other students.
34. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.

Task Value:

12. I think I will be able to use what I learn in this course in other courses.
17. It is important for me to learn the course material in this class.
23. I am very interested in the content area of this course.
28. I think the course material in this class is useful for me to learn.
31. I like the subject matter of this course.
32. Understanding the subject matter of this course is very important to me.

Control of Learning Beliefs:

11. If I study in appropriate ways, then I will be able to learn the material in this course.
16. It is my own fault if I don't learn the material in this course.
24. If I try hard enough, then I will understand the course material.
30. If I don't understand the course material, it is because I didn't try hard enough.

Self-efficacy for Learning and Performance:

13. I believe I will receive an excellent grade in this class.
14. I'm certain I can understand the most difficult material presented in the readings for this course.
19. I'm confident I can learn the basic concepts taught in this course.
21. I'm confident I can understand the most complex material presented by the instructor in this course.
25. I'm confident I can do an excellent job on the assignments and tests in this course.
26. I expect to do well in this class.
33. I'm certain I can master the skills being taught in this class.
35. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Organization:

36. When I study the readings for this course, I outline the material to help me organize my thoughts.
43. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
47. I make simple charts, diagrams, or tables to help me organize course material.
55. When I study for this course, I go over my class notes and make an outline of important concepts.

Metacognitive Self-Regulation:

37. During class time I often miss important points because I'm thinking of other things. (REVERSED)
39. When reading for this course, I make up questions to help focus my reading.
42. When I become confused about something I'm reading for this class, I go back and try to figure it out.
44. If course readings are difficult to understand, I change the way I read the material.

49. Before I study new course material thoroughly, I often skim it to see how it is organized.
50. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
51. I often find that I have been reading for this class but don't know what it was all about. (REVERSED)
54. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
59. When studying for this course I try to determine which concepts I don't understand well.
60. When I study for this class, I set goals for myself in order to direct my activities in each study period.
61. If I get confused taking notes in class, I make sure I sort it out afterwards.

Effort Regulation:

40. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. (REVERSED)
46. I work hard to do well in this class even if I don't like what we are doing.
53. When course work is difficult, I either give up or only study the easy parts. (REVERSED)
57. Even when course materials are dull and uninteresting, I manage to keep working until I finish.

Peer Learning:

38. When studying for this course, I often try to explain the material to a classmate or friend.
45. I try to work with other students from this class to complete the course assignments.
48. When studying for this course, I often set aside time to discuss course material with a group of students from the class.

Help-Seeking:

41. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (REVERSED)
52. I ask the instructor to clarify concepts I don't understand well.
56. When I can't understand the material in this course, I ask another student in this class for help.
58. I try to identify students in this class whom I can ask for help if necessary.

APPENDIX C

E-MAIL SAMPLES

Dr. Peck,
Thanks for meeting with me about my dissertation project. I will be in contact with you after the first of the year to set up a day to come to your class and hand out fliers. Here is the link to the study that I will be giving to students: www.tamu.edu/cae/sisurvey.html <http://www.tamu.edu/cae/sisurvey.html>

The link to the actual survey is dead pending IRB approval. I expect to get that approval before the Christmas break or during the first week of January at the latest. If you are willing to put a blurb in your syllabus about my project, here is some suggested text, but of course, any mention of it will help:

"Students in this course section have been randomly selected to be participants in a research study related to Supplemental Instruction (SI). To participate, you will need to go the following web site and fill out the on-line survey: (www.tamu.edu/cae/sisurvey <http://www.tamu.edu/cae/sisurvey>). It will take only about 10-15 minutes to complete. You are encouraged to participate in the survey whether or not you are planning to participate in SI for this class."

Thanks again for your help. I am hopeful that what I learn from this study will help us in making programs like SI better. Please let me know if you have any questions at this point.

Joel McGee

--
Joel McGee, Associate Director
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Dear Dr. Reed,
It has been several days since I gave out information in your class about the SI survey and I would like to give the students a followup reminder via e-mail. If you would be willing to send out the text below (or something similar) to your students via the NEO system, I would appreciate it. I think it will be most effective if the message comes from you as the professor rather than from me. If for some reason you are unable to send out the e-mail reminder, please let me know and I will try to find an alternate method of following up with the students in your class. Thanks again for your help with my project. It is very much appreciated.

Possible text for followup e-mail:

Students:
You received information a few days ago about completing a survey as part of a research study related to the SI program. If you have not already completed the survey, I would encourage you to do so. You are encouraged to complete the survey regardless of whether or not you plan to attend SI sessions for this or any of your other classes. Here is the web address for the survey:

www.tamu.edu/cae/sisurvey

If you have any questions about this survey, you can contact the researcher, Joel McGee at the following e-mail address: jmcgee@tamu.edu.

--
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Dear Student,
You are enrolled in Dr. Rizzo's Biology 113 class. Earlier this semester I came to your class to give out information about an SI survey. The survey is part of a research study I am conducting for my dissertation and in order to help our SI program improve. Please click on the link below to go to the survey. It only takes a few minutes and the information will be kept confidential.

http://www.tamu.edu/cae/sisurvey.html

You are asked to complete the survey even if you do not plan to participate in SI sessions. If you have any questions about this, please don't hesitate to contact me. Thanks for your help.

Joel McGee
Associate Director
Center for Academic Enhancement
Texas A&M University
jmcgee@tamu.edu

Dr. Johnson,
I wanted to give you an update on the SI survey and thank you again for your help. So far I have an overall response rate of 34% (898 surveys) from the 9 courses. From your classes I have received 177 surveys (30% response rate). The survey will still be available for the rest of the semester, so any encouragement you can give the students to take it would be appreciated. Also, remember that the students who completed the survey have given me consent to receive their final numerical grade for your course. Let me know what would be the most convenient method for you to get those grades to me at the end of the semester.

Thanks again,

Joel McGee

--
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Welcome back from Spring Break! This is a last reminder to take the SI survey. You are currently enrolled in at least one class that is part of the SI research study and as of the end of spring break had not completed the survey according to our records. Your help in completing the survey will be of great assistance to me as a graduate student in completing my dissertation research and will also help us to improve our SI program. If you are in one of the classes receiving bonus points for doing this survey, I will be sending your name (but not your survey answers) to your instructor. Remember we want you to do the survey even if you haven't been attending SI. Use the link below to get to the survey:

http://www.tamu.edu/cae/sisurvey.html

I know you may have received several e-mails about this. I hope this has not been too much of an inconvenience. This will be the last reminder from me. Thanks for your patience and help!

Joel McGee
Associate Director
Center for Academic Enhancement
Texas A&M University

APPENDIX D

INFORMATION SHEET

Research Study on Motivation and Other Factors as Predictors of Engagement in Supplemental Instruction (SI)

INFORMATION SHEET

You have been asked to participate in a research study that is being conducted as a part of a doctoral dissertation project. You were selected to be a possible participant because you are enrolled in a course for which SI is provided. A total of 2,500 students have been asked to participate in this study. The purpose of the study is for the researcher to learn how demographic and motivational factors may help predict who is most likely to attend and actively participate in Supplemental Instruction (SI).

If you agree to participate in this study, you understand that you will be asked to complete an on-line survey questionnaire which includes the Motivated Strategies for Learning Questionnaire (MSLQ). You are also aware that the researcher will be retrieving information about you from the Texas A&M Student Information System (SIMS) and from the Supplemental Instruction (SI) program database. The on-line survey takes approximately 10-15 minutes to complete. There are no known risks or benefits associated with participation in this study.

All of the data obtained in this study will be kept confidential by the researcher and any reports or research papers will not have information about individual students. All data will be stored in a secure, password protected database, and only the researcher will have access to the information. Once all data has been gathered, identifying information such as Social Security Numbers and names will be removed from the data files. Your decision whether or not to participate will not affect your current or future relations with Texas A&M University. If you decide to participate, you are free to refuse to answer any of the questions that may make you uncomfortable. You can withdraw at any time without your relations with the university being affected. You can contact Joel McGee (458-0700 or jmcgee@tamu.edu) or Dr. Christine Stanley, graduate advisor (845-2716 or cstanley@tamu.edu) with any questions about this study.

This research study has been reviewed and approved by the Institutional Review Board – Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, you can contact the Institutional Review Board through Dr. Michael W. Buckley, Director of Research Compliance, Office of the Vice President for Research at (979) 458-4067 or mwbuckley@tamu.edu.

You may want to print off a copy of this form including the researcher's contact information by clicking on your browser's print function.

By clicking on the "Agree" box below, you are verifying that you have read and understand the above information and are volunteering to participate in this study. Once you hit the agree button, you will taken to the survey.

Agree

Disagree

For questions relating to this survey please contact:

Joel McGee at (979) 458-0700 or jmcgee@tamu.edu
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VITA

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Education

Texas A&M University, *College Station, TX.*
Doctor of Philosophy, Educational Administration
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Southwestern Baptist Theological Seminary,
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Master of Arts, Religious Education
December 1989

Baylor University, *Waco, TX.*
Bachelor of Arts, English
May 1986

Professional Experience

Center for Academic Enhancement, *Texas A&M University*
Associate Director (2002 to present)
Assistant Director (1999 to 2002)
Program Coordinator (1997 to 1999)
Lecturer (1995 to 1997)

Safety Education Program, *Texas A&M University*
Research Assistant (1993 to 1995)

New Braunfels Christian Academy, *New Braunfels, TX.*
Language Arts Teacher (1992 to 1993)

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Minister of Youth and Education (1990 to 1992)

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